UNION OF SOUTH AFRICA

DEPARTMENT OF AGRICULTURE

THE

AGRICULTURAL JOURNAL

OF THE

UNION OF SOUTH AFRICA

VOL. I.—FEBRUARY TO JUNE, 1911

Issued by the

DEPARTMENT OF AGRICULTURE

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THE

AGRICULTURAL JOURNAL

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The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

No. 1. FEBRUARY, 1911. Vol. I.

Issued MONTHLY in English and Dutch by the Department of Agriculture.
Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria.

Notes.

Introductory.

In introducing the first issue of the *Agricultural Journal of the Union of South Africa*, it is first necessary, we regret to say, to crave indulgence for the delay which has arisen. That this was unavoidable is very generally known, as, owing to pressure of other matters in the Department of Agriculture, and the requisite transfer of officers, it was not possible to publish the present issue earlier. It is confidently hoped, however, that the next issue will be in the hands of readers at an early date, and thereafter the *Agricultural Journal* will be available about the 15th of each month in the case of the English edition, and a little later in the case of the Dutch. Every endeavour will be made to bring out the two editions as nearly together as possible.

Distribution.

It having been decided by the Right Hon. the Minister for Agriculture that a small charge is to be made for the *Union Agricultural Journal*, the systems of free distribution lately in vogue in the Transvaal and Cape Provinces cannot be revived. All other restrictions, such as those which existed in the Cape, will be removed, and the *Agricultural Journal* will now be available to any one living within the Union of South Africa on payment of the modest sum of two shillings per annum. For this amount the publication will be delivered post free. In order to give every one interested an opportunity of becoming acquainted with the change, the first issue is being distributed to those on the Circulation Lists of the late *Cape, Natal,* and *Transvaal Agricultural Journals*, and each recipient is requested to note that unless the sum of two shillings is promptly forwarded to the Government Printer, Pretoria, the dispatching of the publication will as promptly cease. It is also necessary to remember that the address of the Editor, in future, will be "Department of Agriculture, Pretoria".

Advertisements.

It has also been decided that approved advertisements will be accepted for insertion in this publication, but until arrangements can be completed for the handling of same the *Journal* will appear minus that particular feature. Details as to charges, etc., will be announced later on.

Correspondence and Contributions.

As the whole aim and object of the *Agricultural Journal of the Union of South Africa* will be to assist the farmers of the country to increase their output and improve, wherever possible, the methods hitherto in vogue, it is hoped that all interested in agriculture will do their utmost to assist and forward this ideal. The Scientific and Technical Staff of the Union Department of Agriculture will, as in the past, contribute liberally to the pages of this publication, but, in addition, we should like to urge upon the farmers—agriculturists, pastoralists, or orchardists—to join with us in our efforts by contributing articles for publication, those based on experience or suggestive experiment being most acceptable. The correspondence pages will be open at all times for the expression of individual opinion as well, while under the heading of "Questions and Answers" will be published replies to queries received in the Department or addressed to the Editor during the month. We propose to go even further in this section and furnish replies by post or telegraph if specially requested for urgent purposes.

The Current Issue.

The current issue has been compiled somewhat hurriedly, and we trust that allowance will be made for that fact. In the course of the next month or so we hope to be able to settle down to our stride, when the publication should take on such a form as to include all the better features of the late Provincial publications with, it is hoped, a few special features of more general interest to the whole Union than anything previously attempted. It has also to be borne in mind that the *Union Journal* will circulate freely in both Dutch and English throughout the four Provinces of the Union.

East Coast Fever: An Important Correction.

As a very misleading statement in connection with East Coast fever appeared in the November issue of the *Cape Agricultural Journal*, the same being attributed to Dr. Theiler, C.M.G., Director of Veterinary Research, we take the first opportunity of publishing an authoritative contradiction which should reach the whole country. In that report Dr. Theiler was made to say, in addressing the Inter-Colonial Agricultural Union Congress, that in East Coast fever " . . . *unlike other diseases, immunized animals, as far as they could see, were a source of infection* . . . ". We wish to distinctly point out that this is incorrect. On referring the matter to Dr. Theiler, that gentleman informs us that, so far as he can remember, the following were the words used on that occasion in reference to this matter: "I venture to point out that, so far as experiments allow us to foresee, what is going to happen is, that whilst the animals are being immunized, they are undergoing an active disease; it is true that this disease seems to be less virulent than the natural one, but nevertheless the ticks which happen to be attached to such animals will become infected and they, in turn, will transmit the disease again to susceptible animals. Therefore the inoculation means the propagation of the disease should such animals whilst they are in fever be let loose. Accordingly, one thing is certain, namely, that granted the inoculation becomes a success we

cannot do without restriction, and we cannot do without regulations such as are in force at the present time. The inoculation will only be a means of checking losses by reducing the number of deaths in infected herds, and it will be only one of the means for a final eradication of disease, but that one will have to be made use of with all the precautions which are taken in the Transvaal at the present time and which have been so lucidly explained by my colleague, Mr. Gray."

Unavoidably Crowded Out.

Several articles forwarded for publication in the late Provincial Agricultural Journals have been held over from the current issue, but these will all receive attention in due time. We trust that contributors will accept this explanation and extend a little patience. As the *Journal* is to be published in Pretoria, it has been found most convenient to use matter mostly contributed for the late *Transvaal Agricultural Journal* in this issue, as it was ready to hand, rather than wait longer for specially written articles.

The Union Department of Agriculture.

The following appointments in the Union Department of Agriculture have been approved:—

Acting Director of Veterinary Research: Dr. A. Theiler, C.M.G.
Acting Principal Veterinary Surgeon: Mr. C. E. Gray.
Acting Chief, Division of Entomology: Mr. C. P. Lounsbury.
Acting Chief Chemist: Dr. C. F. Juritz.
Acting Chief, Division of Plant Pathology and Mycology: Mr. I. B. Pole-Evans.
Acting Superintendent of Dairying: Mr. E. O. Challis.
Acting Chief, Division of Publications and Editor *Agricultural Journal*: Mr. F. D. MacDermott.

Bulletin of Entomological Research.

The attention of readers is drawn, by request of the Right Honourable the Secretary of State for the Colonies, to the publication of this new scientific periodical. It is the official organ of the Entomological Research Committee (Tropical Africa), a body composed of twenty or more prominent British authorities in tropical medicine and entomology which was appointed about a year ago by the Colonial Office to promote the interests of entomological research in the tropical possessions of Great Britain in Africa. Although the work of the Committee is confined, at least for the present, to entomological matters pertaining to tropical parts of Africa, its publication is of much value to every one interested in economic entomology, and particularly to those interested in the association of insects with the spread of disease. Four or more parts of the *Bulletin* are to be issued each year, and the subscription price for the first year is ten shillings. Three parts of the first volume have already appeared. These aggregate 232 pages of letterpress, and are illustrated by thirteen full-page plates and a number of maps and text figures. The last part contains original articles on West African fruit flies, West African plant bugs injurious to cocoa, scale insects in Uganda,

and on the habits and movements of the tsetse fly in Nyassaland and adjoining territories, together with a number of notes and abstracts of reports dealing with sleeping sickness and cattle disease. The editor is Mr. Guy Marshall, the Scientific Secretary of the Committee, and to him all communications on the subject of the *Bulletin* should be addressed. His office is in the British Museum of Natural History, Cromwell Road, London, S.W.

Insect Transmitted Diseases.

Mr. D. Niven, Secretary, Rhodesia Scientific Association, P.O. Box 586, Bulawayo, writes:—"Will you kindly give publicity to the following resolution of the Rhodesia Scientific Association agreed to at a meeting of the Council of the Association held recently:—

> 'That a gold medal be offered for an original paper advancing our knowledge of the transmission of any insect or arachnid borne disease affecting Rhodesia. Such paper to be read at a meeting of the Rhodesia Scientific Association for publication in its Proceedings. The medal will only be awarded for a paper which in the opinion of the Council is of sufficient scientific merit'.

"Non-residents as well as residents in Rhodesia are invited to send in papers, which should reach Mr. Niven at the above address not later than 31st July, 1911."

His Majesty the King's Collection of South African Live Animals.

Dr. L. Peringuey, Director, South African Museum, Capetown, writes:—When it was decided that the then Prince of Wales was to come to South Africa to open the First Parliament of the Union, His Royal Highness, being the keen sportsman he is, expressed a desire to accept, in the manner he did when visiting India and Australia, a collection of animals representative of the fauna of South Africa. Unable to do so now that the Prince of Wales has succeeded to the Throne, the King's interest has in no way diminished, and His Majesty recently and since his accession stated that he will be pleased to accept a present of wild animals from South Africa. H.R.H. the Duke of Connaught has been asked, and has consented, to accept the donations here on the King's behalf. The Western Province Association for the Preservation of Game is therefore making an appeal to all sportsmen, owners of game large or small, or those able to procure the same, in the Cape Province, for a united effort in bringing together a number of wild animals, large or small, for presentation to the King; in a word, a presentation well worthy of the occasion. Other Committees are working in the other Provinces. It is not proposed to buy animals. They are to be donated. But as, unfortunately, the climatic conditions obtaining in England are such that the animals could not be sent there in the dead of winter, it is proposed to have the large ones shipped in March only. The centres of the Cape Province in which the animals are to be received, prior to shipment, have not as yet been decided upon, and the owners of large specimens especially may have to keep them some time, in which case, however, cost of keeping or feeding, when of course reasonable, would be

refunded; but it is expected that this difficulty will soon be got over and may probably not arise. Dr. Peringuey would, therefore, urge upon all sportsmen and lovers of animals, not only to join in making this presentation a success, but also to form sub-committees, and even, for that matter, committees, to achieve this object. Of the large animals, young ones are most desirable; of the full-grown, those partially tamed would be most appreciated.

It is difficult to express everything that is required, but it may be said that every animal is wanted except baboons and leopards (tiger). Bats, field mice, hedgehogs, meercats or muishonds, wild cats, porcupines, or golden moles, wild dogs, and hyaenas; jackals, other than the black backed; bonte, bles, and spring boks; kudu or hartebeest, rooi rhebok (which has never been seen alive in England, if in Europe), klipspringer or grey rhebok, grys, stein or blaauw bok. Buffaloes or elephants will be acceptable; the mountain zebra is especially desired. Game birds would also be greatly appreciated, and any other bird as well. Lizards, tortoises, and snakes would also be gladly received. All the donations will be suitably acknowledged on printed forms headed "His Majesty the King's South African Collections", which the donors will treasure as a memento of their generosity as well as of this unique occasion, the opening by Royalty of the First Parliament of the Union. Labels for the packages, cases, crates will be duly sent, and the animals will be conveyed by the Union Railways free of charge, and the Union Government have announced their intention to give housing facilities.

South African Fruit Paste.

The attention of the Department has been drawn to a novel fruit preparation, for which a Harrismith (Orange Free State) lady is responsible, which, by reason of its convenient portability and its cooking qualities, will probably be of great value to travellers, the Army, Navy, and Merchant Services, and in other directions where economy of space is desirable, as well as in the ordinary household. The fruit—and all varieties appear to be equally amenable to the process—is prepared in the form of a long thin roll, and all that is required is to cut off a piece and soak it for a quarter of an hour in water before cooking. This novelty appears to have attracted a great deal of attention in England, and much interest has been displayed in it at the exhibitions in England where it has been shown. Numerous inquiries have been received for trial samples, and, in the opinion of the Acting Trades Commissioner for the Union in London, there appears to be little doubt that a trade could be worked up if adequate supplies could be ensured of uniform quality and in regular consignments.

Mrs. T. van den Bosch, of "Riverside", near Harrismith, Orange Free State, is the lady who has brought this novel method of preparing dried fruit to perfection. We learn that she has taken out a trade mark in South Africa for its protection, and that she would now like some person or company to buy her out as she is unable to undertake the preparation of the fruit by her process on any large scale such as would be necessary for commercial purposes. We might

add that the South African National Union has been interesting itself in this patent preparation, and has done much to bring matters to a head for the purpose of the exploitation of the product on a commercial scale.

The Pruning of Fruit Trees.

We have received the following interesting letter from Mr. R. Baikie, Box 3405, Johannesburg, on the subject of the pruning of fruit trees:—"I hope no apology is needed to approach you on a matter which has for a considerable time exercised my mind, namely, the pruning of fruit trees. For a considerable number of years I have given the matter close attention and in practical form, particularly regarding the general run of deciduous trees grown in the Transvaal, and claim to have met with fairly successful results. Pruning resolves itself into a thorough and systematic thinning out of the imperfect and interfering branches—that the energy of the tree is saved and directed, so to say—that those branches and spurs which are capable will bear the best results.

"Trees should not be pruned to make them assume any definite shape or preconceived whim; each variety of tree should have its own natural or normal form, but pruning it sufficiently so far as shape is concerned to remove any abnormal or unsymmetrical shape, and in doing so the fundamental struggle for existence is reduced within given bounds that the remaining parts may produce larger and better fruits. There are, of course, so many variations in the methods of training and pruning in each different variety that the successful practice can scarcely be made clear in writing.

"Having said so much, I now beg to direct your attention to the terrible vandalism going on year after year whereby so-called expert pruners, advertising themselves as such, are a positive danger and hindrance to the advancement of enterprise and the disgust of the small grower. The destruction being done by these persons season after season is, I assure you, most appalling. Now, writing to the papers on such a serious subject is, I think, undignified, and I would consider it derogatory towards the Department. Some one glib with the pen would be sure to reply, presumably knowing nothing of the matter, but just to be in print. I respectfully submit that some stir should be made. Persons undertaking such work and receiving handsome payment should be made to pass some practical test by the Government Horticulturist or his substitute, so that the public might be protected."

Destruction of Buchu and Bush Tea Plants.

It has been reported to the Minister of Education that a great deal of destruction of buchu and bush tea bushes takes place from time to time in the Cape Province, particularly on private property. It seems almost incomprehensible that the destruction of plants having the economic value that these possess should occur, but the fact remains. We would urge upon farmers to do all in their power to protect these useful bushes as far as possible, whether it is desired to make use of them in the future or not.

Export of Cucumbers.

Readers, and especially those residing in Natal, will be interested to learn that a short time back an experiment was made to ascertain the carrying powers of cucumbers, with a view to working up an export trade in this vegetable with England. Forty-five cases were sent, from Durban, per R.M.S. "Briton", being packed six to eight cucumbers in a case in single layers of wood-wool, and carried in steward's cool chamber. The consignment arrived in England on the 3rd December. The experiment, however, has proved a failure. Most of the cucumbers were absolutely rotten, even the best of them being more or less rotten; there was not a single sound cucumber amongst them, so Messrs. Geo. Monro report through the Acting Trades Commissioner. They add that, "although good fresh cucumbers are getting valuable here, there is no trade for any but those in perfectly fresh condition, and our experience has been that it is very much more difficult to retard vegetables in cool chambers than it is with fruit. We have therefore done what we could to prevent any more money being lost in sending these cucumbers from South Africa, as we do not think it could possibly pay."

South African Comb Foundation.

We learn from Messrs. Cairncross & Zillen, of Pretoria (Church Street Central), that they have imported the necessary machinery for the production of super and brood foundation, and that they are now in a position to supply the wants of bee-keepers in this direction in any part of South Africa providing sufficient wax is procurable. Messrs. Cairncross & Zillen, who are large sellers of bee-keepers' appliances, have been obliged to take this course in consequence of the operation of the Foul Brood Act, which prohibits the importation of bees, bees-wax, comb, foundation, etc. Our correspondents add that they are prepared to purchase South African bees-wax in large and small quantities from farmers and others at highest market prices.

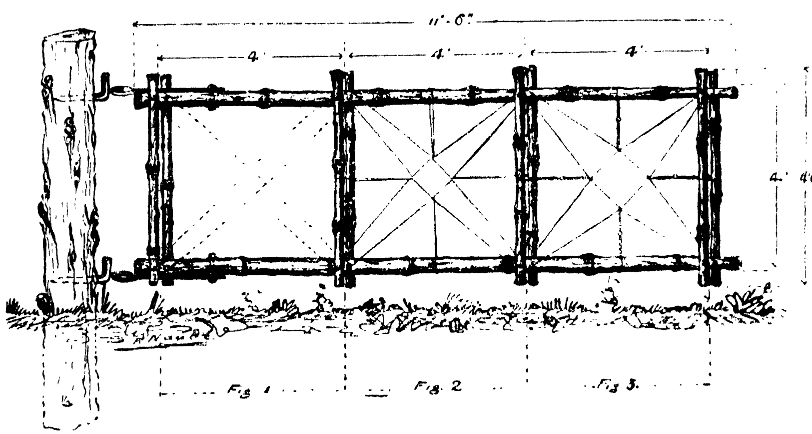
Thorley's Farmers' Almanac.

We have received from Messrs. R. Wilson, Son & Co., of Capetown, a copy of Thorley's Farmers' Almanac for 1911, for which they are the agents in South Africa. This Almanac, which will probably be well known to many of our readers, has now reached its fifty-third year of publication, and is as useful as ever. Among the more noticeable features of the Almanac is the monthly "Breeder's Table", which gives the "date on which an animal served or egg set on any day of present month is due to give birth or hatch"; and mention may also be made of the Diary and Cash Account for each month throughout the year. A considerable portion of the Almanac is devoted to short articles and paragraphs on matters of interest to farmers. There are also a number of useful tables—ready reckoners for various purposes, prices of farm commodities, etc.—which will prove of value to farmers. Copies of the Almanac can be had free on application to Messrs. R. Wilson, Son & Co., P.O. Box 53, Capetown.

A Cheap and Effective Farm Gate.

Mr. W. A. Jonnes, Hartebeestfontein No. 5, Brits, writes:—Having quite a number of gates in various paddocks on the farm I found that constant use of the ordinary Boer gate—four wires with a stick and wire loop-fastener at the top—soon brought it into a bad state. I cast about for a plan of gate that would cost very little, be thoroughly effective, not easily put out of repair, and be easy for a woman to open and close instantly. After trial of several plans I at length made a gate that answered all the requirements, and the cost was so small that I doubt if a cheaper gate could be made to give satisfaction. The ordinary farmer is not in possession of a carpenter's kit of tools, but this gate can be made with a brace and a bit, screw-hammer, and saw, most of which every man has in his yard. As it has proved such a boon to me, running a number of cattle with natives and others constantly going through the gates—opening and closing them with no light hand or attempt to save the gate at any time—I thought perhaps the idea might commend itself to others, if you think it good enough to publish.

I had a clump of bamboo on the farm, which is grown by many farmers for whipsticks (the tops can be used for whips while the bottom thick part is good for gates, etc.), so I cut down several lengths and dried them thoroughly before cutting off the thickest



parts. Starting with two lengths of 11 ft. 6 in., which I laid on the ground 4 ft. apart, I then cut eight pieces of 4 ft. 6 in. each and about 1¼ in. thick. Laying these in four pairs I bolted them on each side at top and bottom through the two thick pieces with iron bolts about 6 in. by ¼ in. thick. This gave me a rough skeleton of a gate with three open panels. Taking care to get the frame square, I then threaded two double lengths of ordinary fence wire cross-corner fashion round the bolts, twisting the ends together as shown in dotted lines (Fig. 1, Sketch). I then stretched four pieces from top, bottom, and both sides as sketch (Fig. 2). Putting a rough chisel between the last wires I kept on twisting each in turn until every string was tight, the result being as Fig. 3. This left me with a three panel gate as rigid as a stone and free from all warp, which latter can only be prevented by careful attention to the wire twisting. Each panel looks of course

like Fig. 3. I then hunted up some old pieces of large flat bolts from the scrap heap and found two with a hole at each end, which acts as a hinge to hang the gate by. These two pieces I bolted on to the bamboo as shown in the sketch, and then taking two lengths of iron rod from an old plough I bent them each to a right angle, and, boring a hole in the gate-post, which I had already hung, I drove them in and hung my gate in a second or two.

The first gate I made like this has now been in almost hourly use for fourteen months. Even an old mule, who succeeded in smashing every gate we had on the place, has been " fooled " by this one, and it is in as good order as the day I put it up. Since then I have made others on the same pattern, and as the entire cost to me for each gate totals about 3s. for bolts and wire, plus time spent in making, for which we reckon nothing on the farm as it can be done on odd wet days under a shed, I do not think a farmer can get a better gate. Even for a carriage drive it makes an exceedingly pretty gate, and, when painted white, it shows up in the dark, and is so light that a child can open and close it with one hand. An additional advantage in the lightness is that when a careless person swings it back hard it has no tendency to break as a heavy gate does, and for the same reason it never sags on the hinges.

I have often wondered why some of the gatemakers do not make something similar for city use, as they could be sold at a low price and are just as effective as cumbrous iron gates which always seem to be out of repair.

There is of course no reason why the gate should not be made out of saplings, but it would not be quite so light. I have three more to make and am clean out of bamboo, so intend making them from round boughs.

Stiff-Sickness or Stijfziekte in Cattle.

By DR. ARNOLD THEILER, C.M.G., Acting Director of Veterinary Research.

THE term "stiff-sickness" or "stijfziekte" in cattle applies to a disease which has been known in South Africa for many years, and which is still found in certain parts of the Cape, Orange Free State, and the Transvaal. The same name has, within the last few years, also been applied to the disease known as "three days' sickness" on account of the presence of certain symptoms as may be surmised by the name. With the exception of the name, the two diseases are in no way connected with each other, the "three days' sickness" in particular being of a contagious nature, having had all the character of an epizootic which swept through the country, and disappeared again. Stiff-sickness proper is attached to certain farms, where it may occur as an endemic or in outbreaks of individual animals, and appears practically every year at more or less the same season.

Hutcheon, the late Principal Veterinary Surgeon of the Cape Colony, mentions in his earlier reports the presence of "stiff-sickness" in various parts of the Cape Colony, and collected the first evidence concerning the symptoms and the peculiar conditions under which it is met with. He formulated a theory as to the probable cause and, based on it, recommended a treatment which ever since has been largely made use of with varied results and has formed the subject of much discussion in farmers' circles. In his report, *Hutcheon* mentions stiff-sickness and lam-sickness frequently together, and even goes so far as to identify the two, considering the one, stiff-sickness, more as a chronic form, and lam-sickness as an acute form of the same ailment. Although we are no longer justified in holding this view, the fact remains that, in various parts of South Africa, both diseases are met with at the same time and on the same farms. Since the views of *Hutcheon* have, for the last twenty years, been those most frequently quoted and to a large extent adopted, I consider it advisable to repeat them here, inasmuch as the actual observations still hold good, although we do no longer interpret them in the same way. In his report of 1884, he writes about the occurrence and frequency of stiff-sickness as follows, and says:—

"Individual cases of the disease may appear at any time of the year, especially during a period of drought like that which was experienced in the territory of Griqualand West during the years 1882-83, but in ordinary seasons it is most prevalent during the early spring months after the grasses have shed their seeds and become withered and before fresh grasses have sprung up. It generally disappears after good rains. Animals of all ages and of either sex are subject to the disease, but young growing stock and cows either in calf or giving milk are by far the most liable to become affected. Full-grown oxen are seldom affected, and oxen in work are still more rarely attacked. Young heifers are said to be more frequently attacked than bullocks of the same age, and cows immediately before and immediately after calving are more subject to the disease than the same animals at any other period.

"In ordinary seasons the mortality from 'stijfziekte' is not very great. In cases which terminate fatally, the animals that die do not succumb to the direct effects of the disease so much as to the poverty which is induced by the pain which the affected animals suffer in walking; this prevents them from travelling far in the search of food. The majority, therefore, die of debility and starvation".

It was found that, in the Western Cape, the disease was associated with a peculiar condition of the soil, and with regard to this character *Hutcheon* says:—

"The disease manifests itself on different kinds of soil, but within the territory of Griqualand West it is most prevalent along that elevated plateau called the Kaap Range. On that tract of country the soil is principally calcareous, a sort of magnesian limestone, intermixed in some places with a red sandy loam. On many parts along the valleys of the Vaal and Harts Rivers, where the soil is more of a clay loam, the disease is rarely seen, and when animals which are infected with the disease are removed to such localities, all symptoms of the disease disappear rapidly. But on whatever character of soil the disease manifests itself, whether calcareous or red sandy loam, there are clear indications that the vegetation which grows upon such a soil during the prevalence of the disorder is deficient in one most essential ingredient of a complete food, viz., phosphates".

These observations, made by *Hutcheon*, led him to form his opinion of the nature of the disease as follows:—

"This leads us to consider the nature of the disease. 'Stijfziekte' is what is termed an enzootic disease, that is, a form of disease which is confined to certain localities, and is due to some special conditions which are peculiar to the soil, food, or water of such localities. In this disease the enzootic influence is, in my opinion, a peculiarity of the soil which, in dry seasons, becomes incapable of supplying all the ingredients in their proper proportion which constitute a complete plant food. The soil may and does contain all the necessary constituents of plant food, but they exist in an unavailable form. There is often a great quantity of fertilizing matter in the soil, but not in a condition immediately available for the growth of plants. Thus phosphates exist often potentially in a dormant state in the soil in great abundance, but it is not until they have been brought into a soluble form that they are of any use as food of plants. The phosphates are highly important in an agricultural point of view; unless they are present no albumen or other azotized matter can be formed. Azotized matter cannot exist without the presence of phosphates". (Balfour's Botany.)

Based on this deduction, *Hutcheon* then formulated the theory that "stijfziekte" is due to the *want of phosphates in the food*, and to *the withdrawal of such by the growth of the* calf both in utero and after birth, and in support of this theory he gives his reasons, which explain all the symptoms found in "stiff-sickness" both during life and after death.

"*First.*—By the intense craving for bones and all kinds of animal matter which the stock that are grazed on such pastures manifest; as already stated, on many farms along the Kaap Range, cattle were reported to have eaten the complete carcasses of lambs, whilst at Spuitang not a vestige was left of the carcasses of about two hundred cattle. It is noticeable also that this craving for animal matter

increases as the disease becomes more prevalent and almost ceases when the disease disappears.

"*Second.*—By the nature of the disease, 'stijfziekte' being a congested and inflamed condition of the bones and articular cartilages of the fore legs due, in my opinion, to the want of sufficient phosphate of lime in their composition. In healthy bone this salt should form about 50 per cent. of its whole substance. It has also been shown by experiments conducted by *Chossat*, *Roloff*, and others that when animals are fed upon a diet deficient in phosphate of lime the bones lose more or less of their hardness and firmness and exhibit the lesions of osteomalacia and rachitis. Conversely, *Roloff* found that by administering phosphate of lime to a young rachitic dog it thoroughly recovered in three months. During my journey through the territory of Griqualand West, I saw several cases of typical rachitis in young animals. Two very aggravated cases were shown to me at Daniel's Kuil, one of a young bullock belonging to Mr. Beadle, the other a young animal belonging to Mr. Ayton: the knees overlapped one another to a considerable extent, yet the legs of both animals were perfectly normal at birth. It is worthy to remark that calves while suckling do not become affected with the disease.

"*Third.*—By the fact that young growing animals and cows which are either nourishing a full-grown foetus in utero, or secreting a full supply of milk immediately after calving are the animals most liable to become affected with the disease. A good illustration of this fact was brought to my notice at Daniel's Kuil. On the farm belonging to Messrs. Wilmore, adjoining Daniel's Kuil, I was informed that one hundred full-grown oxen had been grazing there for eleven months, that they had not been inspanned nor once off the farm during the whole of that time, and that not one of them had become affected with either stijfziekte or lamziekte, whilst during the same period the Messrs. Wilmore lost seventy fine head of breeding stock, cows and young growing cattle, from these diseases. I heard of numbers of exceptions to this rule, but this did not alter the generally acknowledged fact that young, growing animals which require a greater proportion of phosphates in their food for 'cell formation' and nourishment for growing tissue, especially bones, and cows, the blood of which is being drained either to nourish the developing foetus in utero or to supply that nourishing fluid milk which forms the food of the growing tissues of the calf after birth, are the animals most liable to become affected with these diseases.

"*Fourth.*—By one of the successful measures which are adopted for the cure of stijfziekte, viz., active exercise. When an animal, either a bullock or a cow, becomes affected with the disease, if you inspan the animal at once, either to a wagon or a plough, the symptoms of the disease invariably become very much ameliorated. How is this? During active exercise there is increased tissue change produced in the organs employed, and one of the substances formed during this process of the disintegration of tissue is phosphoric acid, which would be acted upon by the carbonate of lime which is present in these districts in great abundance, and this forms the phosphate of lime required. This is making the animal manufacture phosphates for its own consumption. The active exercise would of itself produce healthy nourishment in the affected bones by increasing the circulation of the blood within their textures and relieving the tendency to congestion which always exists in these diseases.

"*Fifth.*—By the fact that the disease is most prevalent when the vegetation contains the least nourishment, such as a period of drought like what was experienced during 1882-83 and 1884, and in ordinary seasons during the winter and spring months after the grasses have ripened and shed their seeds and thus parted with a great proportion of their nitrogenous and flesh-forming substances. When the grass grows up luxuriantly after good rains, such as they were favoured with in the territory of Griqualand West during the first months in 1884, the disease suddenly disappears. As already stated, I had to travel over the whole territory before I could find a sufficient number of typical cases to enable me to form an opinion upon the nature of the disease. Further, the disease manifested itself during the recent drought on farms upon which it had not been observed before, and, as already mentioned, according to the old Griquas' statements, it had carried off almost the whole of the cattle in the Griqualand West territory three times within the last hundred years; and each of these calamities occurred during a period of exceptional drought.

"*Sixth.*—By the fact that where the stock were supplied with mealie stalks, chaff, etc., mixed with common salt, the disease did not manifest itself amongst them. Mr. Leischman, on the Kaap Range, supplied me with information confirmatory of this fact.

"The above facts appear to me to indicate that the diseased condition, termed 'stijfziekte', is due to defective nutrition of the bones of the affected animal, and that this arises from the absence of a sufficiency of phosphates in the vegetation upon which the animal feeds. It may or may not be chemically deficient in the soil, but it is not available for plant food".

SYMPTOMS OF STIJFZIEKTE.

Cattle which are contracting this disease show indications of it by frequently lying down, by labouring under difficulties when rising, and in taking a peculiar position when standing. It is frequently noted that the animals alternately raise their front legs, apparently indicating some inflammatory process in the feet. The front feet will be found placed slightly forward, and the hind legs underneath the abdomen; the back becomes arched. This position is distinctly pronounced when the animal is caused to move on. The hind legs are then placed well under the body, and the front legs are hurriedly moved forward and the weight is placed on the heels. Evidently much pain is felt when the weight of the animal comes fully down on the hoofs. Accordingly the walk of such an animal resembles that of a horse with laminitis.

In this stage the horn of the hoofs feels warm and even hot, and when of white colour a distinct reddish tinge can be observed through the transparent horn. The animal feels pain when the hoofs are compressed or sounded with a stone. When lifting up one leg at this stage, the animal can hardly stand on the other one, showing much pain. As the disease progresses the animal places all its weight on to the heels; these almost touch the ground, and the toes separate from each other and turn slightly up in front. The obtuse angle between the second and third phalanx becoming sharper, a fold of the skin being formed where the coronary bone joins on to the hoof. The horn of the hoof soon begins to grow longer; it is noticed that the inner toe grows as a rule more rapidly than the outer ones, its point over-reaching that of the outer one. The horn itself shows rings

round the coronary band which descend with the growth of the horn. In cases of some standing the toes grow out and completely turn up. This appearance resembles that found in cattle which are constantly kept in the stable and whose hoofs are never cut short, with the difference that, in stiff-sickness, the animal is down on its heel. If the horns are left untouched and the animals are put out to pasture, they finally are worn off and the hoof again presents a normal appearance. This is particularly the case when the cattle are removed out of the locality in which they contracted the disease.

When, however, the animal is kept under the conditions in which it contracted the disease and no change of pasture or food takes place, it may become unable to stand any more on its feet, but constantly lies down and is unable to seek its food. Finally it will die of starvation.

It is a noteworthy fact that this course of the disease is not characterized by any distinct rise of temperature or at least by any typical curve. The course of the disease is chronic if not attended to; restitution takes months.

THE CAUSE OF STIFF-SICKNESS.

The evidence brought forward by *Hutcheon* as to the cause of this disease is only of a circumstantial nature, and although the many facts might be explained in the light of a deficiency of phosphates, yet no actual proof has been given that such is the case. If it was so, we would undoubtedly be in the position to demonstrate it by a chemical analysis of the bones from an animal suffering from the disease.

Accordingly we lost no opportunity in submitting bones of diseased animals to the Government Chemist, and at the same time we also submitted bones of animals of which we were certain that they did not originate from animals either suffering from stiff-sickness or having come out of a stiff-sickness area.

The following is the report of the Chief Chemist:—

	Ox No. 543. Per cent.	Ox No. 563. Per cent.	Calf No. 568. Per cent.	Heifer No. 639. Per cent.
Moisture	6.60	9.10	10.00	9.24
Organic matter	39.06	35.86	35.34	38.24
Ash	54.34	55.04	54.66	52.52
The organic matter contained—				
Fat...	10.14	6.41	5.17	8.11
Nitrogen	4.06	4.33	4.34	4.29
The ash contained—				
Lime	30.00	30.74	30.48	27.76
Phosphoric acid ...	22.55	22.80	22.33	23.46
Silica	0.22	0.34	0.46	0.91

"It will be observed that the percentage of ash does not vary greatly, and the differences are still less if the percentage in the dry 'fat free' bones is calculated, as will be seen from the following:—

Animal.	Percentage ash in "fat-free" bone.
543	65.2
563	65.0
568	64.4
639	63.6

"Mr. Ingle found that the ratio of nitrogen to ash in the original bones was perhaps the best means of judging the health of the bones. Here, again, the results show no more variation than one would expect from the age of the animals:—

Animal.	Ratio of nitrogen to ash.
543	1 : 13.4
563	1 : 12.7
568	1 : 12.6
639	1 : 12.2

"*A chemical examination of the bones therefore reveals nothing abnormal except perhaps the rather high ratio of phosphoric acid to lime in the bones of heifer* 639."

The numbers 563 and 568 refer to animals suffering from this disease. The numbers 543 and 639 succumbed to other diseases. The analysis proves clearly that there is no deficiency in phosphates; as a matter of fact there is no difference in the chemical constitution between the bones of the various animals.

In March, 1908, Mr. Gray and myself paid a visit to Zeerust, in which neighbourhood the disease was known to exist, and the Government Veterinary Surgeon, at that time Mr. Evans, was able to show us a few acute cases which had only recently developed as well as some chronic cases of some standing. When we saw these acute cases for the first time, we were struck by the similarity of the symptoms with those of which we were familiar in a disease in horses called "laminitis", in which the seat of the lesions are the laminae of the hoof. The advanced or chronic stages of stiff-sickness also corresponded, in our opinion, to the sequel of laminitis in horses.

Considering the fact that laminitis in horses, besides other causes, may be due to over-feeding with certain foodstuffs, such as barley, rye, beans, etc., whereby probably some specific toxin acts on the laminae causing an inflammatory condition, we did not hesitate to discard the theory of *Hutcheon*, and were inclined to look for the cause in the direction of some specific plant which would be found on these particular farms.

For many years stiff-sickness in the Transvaal has to some extent been connected by farmers with the plant *Crotalaria burkeana*, which plant was accordingly called the "stijf-ziekte boschje". We at once thought that this plant may be the real cause, as undoubtedly at one time farmers have drawn their conclusions from actual observations.

This deduction, however, did not seem to have been universally accepted. It is perhaps of interest to note that, in the report of *Hutcheon*, no mention is made of this plant by the farmers of the Cape, a fact which, had it been there, would not have escaped *Hutcheon's* observations and annotation, and would have caused him to give the matter full consideration. Notwithstanding this, the opinions as to the cause of stiff-sickness in the Transvaal were also much at variance, as is the case with many other maladies. Accordingly, from our point of view, the question whether this particular plant is associated with stiff-sickness could only be settled by actual experiments.

Some years ago Mr. Johnston, then Government Veterinary Surgeon at Barberton, informed us of the presence of a disease in the neighbourhood of that town which was called stiff-sickness, and which he described as laminitis of cattle. No special notice was taken

at that time because it was not connected with any specific cause. Just previous to our visit to Zeerust, the late Mr. Turnbull, then Government Veterinary Surgeon at Barberton, drew our attention to the existence of stiff-sickness in the locality, and he connected the disease with the presence of *Crotalaria burkeana*, this plant being present in large quantities on the particular farms where the disease was existing.

Having decided to solve the question by experiments, we had the plant sent to us both from Zeerust and Barberton, and an animal was fed at the station on three successive days, and again for one day after an interval of twelve days, receiving an average of 6 lb. per diem. There could not be any doubt as to the identity of the plants, as samples were submitted to Mr. Burtt-Davy, the Government Botanist, who verified the identification.

Having obtained but negative results from feeding the plants in this Laboratory, I decided to undertake the experiments in a different way, namely, by sending cattle from the Laboratory to both localities, Barberton and Zeerust, where they had to be stabled and fed with this plant daily; in case there was not sufficient of it to supply the needs of the animals, provision was made to supplement it with veld hay sent from Pretoria.

EXPERIMENT No. 1.

The late Mr. Turnbull kindly superintended the experiment in Barberton, and the following are his notes on the subject:—

Cow 607.—Arrived in Barberton on the 17th March, 1910.

Date.	Temperature.		Quantity of Crotalaria eaten.	Remarks.
March.	Morning.	Evening.		
18	101·2	101·6	About ¾ lb	Refused to eat it except cut up with forage.
19	100·8	101·4	„ 5 „	
20	100·6	102·0	„ 10 „	
21	100·6	101·2	„ 14 „	—
22	100·8	101·8	„ 16 „	—
23		101·2	„ 16 „	—
24	100·4	—	„ 14 „	Mixed with veld-hay; tender on her feet.
25	99·8	—	„ 10 „	—
26	100·6	—	„ 10 „	—
27		—	„ 11 „	—
28	101·0	—	„ 10 „	—
29	101·6	—	„ 11 „	—
30	101·0	101·2	„ 11 „	—
31	100·0	101·4	„ 18 „	—
April.				
1	100·2	101·8	„ 18 „	
2	102·2	102·4	„ 18 „	
3	101·4	102·2	„ 18 „	—
4	101·4	102·0	„ 24 „	—
5	100·8	101·6	„ 24 „	—
6	100·2	101·8	„ 24 „	—
7	101·0	101·8	„ 28 „	—
8	—	101·8	„ 20 „	—
9	101·0	—	„ 15 „	Cow always lying down.
10	—	101·0	„ 20 „	„ „
11	—	102·0	„ 15 „	„ „
12	—	—	„ 15 „	„ „
13	101·4	101·8	„ 15 „	„ „
14	—	—	„ 15 „	—
15	101·0	—	„ 9 „	Constantly lying down; when made to stand, back arched, hind feet under body, alternately raising her fore feet as though in pain.
16	101·2	—	„ 9 „	
17	—	102·6	„ 9 „	
18	102·0	—	„ 9 „	

Stiff-Sickness or Stijfzickte in Cattle.

Stiff-Sickness : Chronic stage.

Stiff-Sickness or Stijfziekte in Cattle.


Commencement of separation of digits.

Commencement of separation of digits.

Acute case of disease.

Acute case of disease.

Stiff-Sickness or Stijfziekte in Cattle.

Stiff-Sickness: Hoofs of a chronic case.

Photo by W. F. Davis.

Crotalaria burkeana (Benth.)—Fruiting branch.

Cow 624.—Arrived in Barberton on the 17th March, 1910.

Date.	Temperature.		Quantity of Crotalaria eaten.	Remarks.
March.	Morning.	Evening.		
18	101·4	102·0	About 1 lb	Refused to eat it except cut up with forage.
19	101·4	101·2	" 6 "	Crotalaria mixed with forage.
20	101·2	102·0	" 11 "	" "
21	101·4	101·6	" 16 "	" "
22	101·0	101·6	" 17 "	" "
23	—	101·8	" 17 "	" "
24	101·2	—	" 15 "	Mixed with veld-hay; a little tender on feet.
25	101·6		" 17 "	Going very tender; digits widely separated.
26	101·2	—	" 12 "	—
27	Not taken.		" 16 "	—
28	101·4	—	" 15 "	—
29	101·8		" 16 "	—
30	102·6	102·6	" 16 "	—
31	102·2	104·0	" 18 "	—
April.				
1	103·0	104·0	" 16 "	Took blood smear; Government Veterinary Bacteriologist reported negative.
2	104·2	104·6	" 16 "	Blowing a little.
3	104·4	104·8	" 16 "	
4	104·4	104·6	" 20 "	—
5	104·0	106·0	" 5 "	Off her feed; lying down blowing; took smear; Government Veterinary Bacteriologist reported negative.
6	104·8	105·8	None.	Dull; not feeding; fed with hay and lucerne.
7	103·0	103·0	"	Feeding little; smears; Government Veterinary Bacteriologist reports "marginal points" (*Anaplasma marginale*).
8		104·0	"	Feeding; chewing cud.
9	103·0	—	"	—
10	—	102·4	"	Feeding well.
11	—	103·0	About 20 lb	
12		—	" 14 "	Not feeding well.
13	102·0	101·8	" 10 "	" "
14		—	" 12 "	" "
15	101·2	—	" 10 "	" "
16	101·6	—	" 18 "	Feeding well.
17		103·8	" 18 "	" "
18	102·6	—	" 18 "	" "

Cows 624 and 607 were returned to Pretoria on the 21st April, when the following notes were made: "Condition fair; the signs of acute laminitis are pronounced, the animals placing their legs forward and leaning the weight on the heels, which almost touched the ground. The hind legs are placed much in advance. The action of walking appears to be very painful. The front and back hoofs appear longer than normal, the digits standing apart. The inner digits of front and hind feet are longer than the outer ones; the coronary portion is swollen. The horn of the hoof has a reddish appearance and feels warm to the touch. On lifting one leg the animal shows signs of great pain." It will be noted from Mr. Turnbull's remarks that

cow 624, after one week's feeding, showed the first symptoms of stiff-sickness, whereas in cow 607 these only began to appear after three weeks' feeding. Of the two cows, 624 showed the most pronounced symptoms.

Accordingly the disease corresponded with that observed by us in Zeerust and had to be identified as stiff-sickness.

EXPERIMENT No. 2.

Meanwhile a second experiment was started on the 8th April, when two animals, Nos. 580 and 868, were sent to Zeerust and stabled on the farm Kalkfontein. Mr. Webb, the present Government Veterinary Surgeon, looked after the interests of the experiment, and the following details are taken from his notes:—

"The two animals were constantly tied up and fed with *Crotalaria burkeana* daily. The average ration the animals received was about 4 lb. per head; they ate the plant well.

"On 29th April one of the cows (No. 868) showed the first symptoms of stiff-sickness. The following day the other animal (No. 580) had similar symptoms. Both animals were feeding well. On the 7th May cow 580 was suffering from apparent stiff-sickness: she had great difficulty in walking, and frequently laid down. In the other animal (No. 868) the disease did not develop more noticeably."

The animals were returned to Pretoria on the 12th May, and were examined here when the diagnosis of stiff-sickness was confirmed.

EXPERIMENT No. 3.

This was undertaken for the purpose of producing a very severe attack of stiff-sickness, so that one of the animals could be killed in order to study the pathological anatomical lesions which would result from eating the plant.

On the 18th April, cows 843 and 845 were trucked to Barberton. Mr. Turnbull's notes are given hereunder:—

Cow No. 843.

Date.	Temperature.		Quantity eaten.	Remarks.
April.	Morning.	Evening.		
19	-	- -	About 3 lb	Arrived from Pretoria; condition good.
20	101·2		„ 18 „	
21	101·0		„ 18 „	
22	- -	-	„ 18 „	Lying down; lowering head turned to right flank; got up with difficulty: stood with fore legs stretched out.
23	102·0	-	„ 6 „	Lying down most of day.
24	102·4	103·5	„ 9 „	„ „
25	102·0	103·0	„ 6 „	„ „
26	101·8	102·8	„ 9 „	„ „
27	102·0	103·8	„ 9 „	„ „
28	102·2	103·2	„ 9 „	„ „
29	101·6	103·8	„ 9 „	Made to stand; did so with difficulty; lowed, and kept alternately raising her feet.
30	101·8	103·4	„ 12 „	Lying down.

Cow No. 843—continued.

Date.	Temperature.		Quantity eaten.	Remarks.
May.	Morning.	Evening.		
1	101·6	103·0	About 18 lb.	Food given to her on the ground: would get on to her knees and remain there.
2	102·6	103·5	" 9 "	Lying down.
3	102·2	103·0	" 18 "	"
4	102·8	103·0	" 18 "	"
5	101·2	103·0	" 18 "	No sooner on her feet than she was down again at once.
6	101·8	103·4	" 10 "	Lying down.
7	101·6	102·4	" 9 "	"
8	101·6	102·5	" 9 "	"
9	102·0	103·5	" 10 "	"
10	101·8	103·0	" 18 "	—
11	102·6	103·2	" 18 "	Lowing as though in pain.
12			" 18 "	Lying down.
13			" 18 "	"
16	102·0			—

"From 14th-25th May was too busy to attend to the experiment, but cow received 18 lb. *crotalaria* daily. The native in charge stated she ate more of it. She was made to stand every day to allow her to void her urine. Returned to Pretoria on 26th May."

Cow No. 845.

Date.	Temperature.		Quantity eaten.	Remarks.
April.	Morning.	Evening.		
19			About 1 lb.	Arrived: condition very poor.
20	99·8		" 3 "	
21	101·8		" 18 "	
22			" 18 "	
23	101·4		" 9 "	A bit tender on her feet.
24	100·8	102·8	" 18 "	Lying down most of the day.
25	101·8	103·2	" 18 "	Lying down, but would get up to feed.
26	100·8	102·0	" 18 "	" " "
27	100·8	102·0	" 18 "	" " "
28	102·0	103·4	" 18 "	" " "
29	100·8	103·5	" 18 "	" " "
30	102·8	103·2	" 18 "	" " "
May.				
1	101·2	102·6	" 18 "	Got up with great difficulty.
2	101·4	102·0	" 9 "	Down fed off ground.
3	102·2	101·6	" 18 "	" "
4	101·4	101·8	" 18 "	" "
5	101·4	102·2	" 18 "	" "
6	101·2	102·2	" 15 "	" "
7	101·2	101·8	" 12 "	" "
8	101·4	101·6	" 12 "	" "
9	101·0	102·2	" 15 "	" "
10	101·4	102·4	" 18 "	" "
11	101·6	102·2	" 18 "	" "
12	...		" 18 "	" "
13	...		" 18 "	" "
14	101·4		" 18 "	" "

"From the 14th-25th May too busy to attend to experiment. The native in charge stated this cow was always lying down, but ate most of her daily ration of *crotalaria*, which was 18 lb. daily. Returned to Pretoria on 26th May."

On the 26th May both of these cows were returned to Pretoria, and the diagnosis of stiff-sickness was confirmed. It will be noted that the first symptoms in 843 appeared four days after feeding the plant, and four days in 845.

As cow 843 showed the disease in a more pronounced way than the others, she was killed on the 8th June, and the following notes were taken at the post-mortem by Mr. D. T. Mitchell: "Section of claws of the hind and fore feet show the presence of fibrous granular tissue a quarter of an inch thick separating horny and sensitive laminae, particularly marked near the toe and more pronounced in the hind than in the fore claws. The tissue around the coronopedal articulation is very much thickened and cutting hard (dense fibrous tissue). Articular surface of *os coronae* and *os pedis* show thickening and slight hyperaemia of the synovial capsule."

EXPERIMENT No. 4.

Towards the end of April, 1910, 12 lb. of *Crotalaria burkeana* were received from the Orange Free State and sent to the Laboratory by Mr. Burtt-Davy with the request that experiments be conducted with the plant.

Accordingly, on the 3rd April, cow 911 was used for this purpose. Two gallons of tea were made with which the animal was drenched, and the plant was then mixed with the food and was readily eaten. No symptoms developed.

CURATIVE TREATMENT.

The essential of all treatments for disease is contained in the phrase "remove the cause, and the effects will cease", and this applies in particular to stiff-sickness in cattle. As soon as the disease is noticed, and the diagnosis confirmed by the presence of the plant, it is advisable to change the pasture immediately, and give the animals different food; if possible, succulent or soft foods should be substituted.

In the treatment of laminitis in horses, two methods are adopted, both of which are beneficial, and can be recommended for the treatment of laminitis or stiff-sickness in cattle. (1) Evacuation of the bowels in order to remove any possible remnants of the plant contained in the stomach and intestines; this should be done by the administration of a large quantity of epsom or glauber salts, 1 lb. to 2 lb. dissolved in four to six bottles of water, and give the whole quantity within two or three hours. (2) Withdrawal of a quantity of blood; in horses with an acute attack of laminitis, the immediate withdrawal of one, two, or even three gallons of blood, according to the size of the horse, sometimes stops the further development of the disease almost immediately. The same may apply to cattle, and I have received information from certain farmers who have tried this treatment that they have noticed a decidedly beneficial effect. All these treatments apply, of course, to acute cases of the disease. Once the disease has become chronic, an immediate change in condition cannot be expected, but by all means remove the cattle from the pasture.

PREVENTIVE TREATMENT.

It is hardly necessary to point out the direction in which prevention lies. It remains with the farmer himself to become fully acquainted with the plant, and to see whether it grows on his farm. If so, it would be advisable to have it destroyed, or, if this task proved to be too heavy, the cattle must be kept away from that place.

CONCLUSION.

1. The disease "stiff-sickness" in cattle resembles in all respects laminitis in horses, in fact it may be called "laminitis in cattle".

2. The experiments undertaken at two different places, Barberton and Zeerust, one in the eastern and one in the western part of the Transvaal under opposite climatical and tellurical conditions, show that *Crotalaria burkeana* is the cause of stiff-sickness. Referring to our earlier experiments and to Experiment No. 4, all of which were failures, we notice that under certain conditions *Crotalaria burkeana* does not cause stiff-sickness. This may be either due to the fact that (*a*) although a considerable quantity of the plant was given within a short period, the feeding was not continued long enough and not with a sufficient quantity of the plant to cause laminitis; or (*b*) the plant with which the feeding experiments were conducted at the Laboratory was always in a dry state, and that with which the animals were fed outside was always freshly cut.

Finally, I wish to tender my best thanks to Mr. J. Burtt-Davy, F.L.S., for his assistance in determining the various samples of plants forwarded; to Mr. H. Ingle, B.Sc., F.C.S., etc., for his analysis of the different bones; to Mr. H. M. Webb, M.R.C.V.S., for looking after the interests of the experiment in Zeerust, and to place on record the good services rendered by the late Mr. H. X. Turnbull, M.R.C.V.S., who superintended the experiment in Barberton.

Means of Control of Farm Stock.

By J. M. CHRISTY, Assistant Principal Veterinary Surgeon (Transvaal).

IN the April number of the *Transvaal Journal* I dealt with the "Means of Control of Horses". I now propose to briefly describe the means of control that may be adopted in dealing with domesticated animals other than the horse.

MANNER OF SECURING THE OX FOR OPERATION.

The majority of operations are performed on the bovine species in the standing position, and the means of restraint are various. The ox is not so amenable to the influence of the voice and caresses as the horse, and these cannot, therefore, be relied upon. To secure the head is the chief object, as this prevents attacks and struggles. In all operations, it is achieved as follows:—

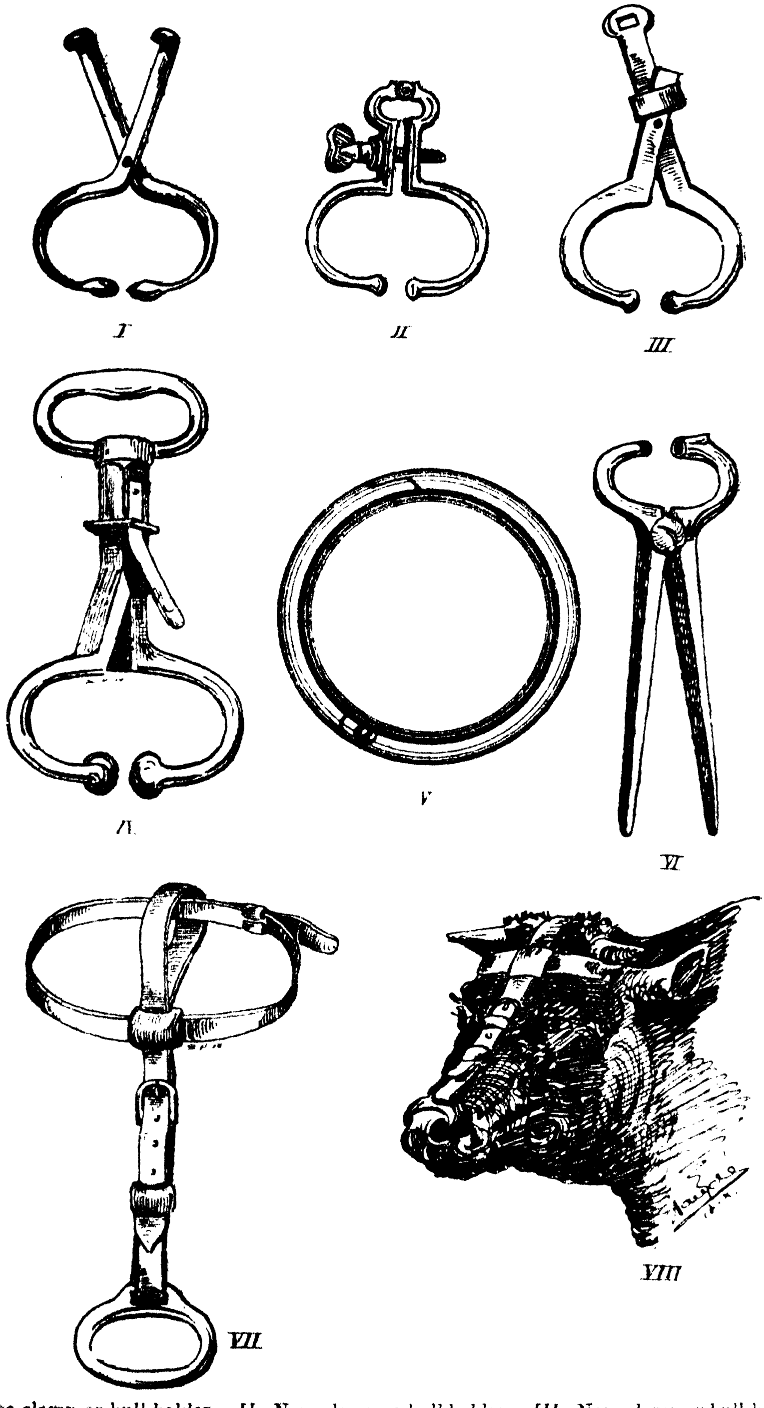
(1) An assistant places himself on one side of the neck, the left for instance, and with the corresponding hand seizes the horn on that side of the head, while he passes the other hand between the horns down to the nose, inserting the thumb into one nostril, the first and middle finger into the other, and firmly seizes the septum. In many cases a tap on the horn with a stick will render the animal more docile.

(2) One end of a long rope is tied round the base of the horns; it is then passed backwards, forms a turn round the chest, another round the loins, and is fastened to the root of the tail, so as to elevate the head in such a way that when the animal attempts to lower it, the rope induces so much pain and discomfort that it desists.

(3) Tying the head to a pillar, post, or tree by means of a cord fastened round the base of one horn, then round the other horn, around the neck and the first horn, and around the post back to and around the second horn, again round the post, and finally around the nose, where the end is held by an assistant. There are other methods of tying the head, but they are all on the same principle, and are adapted to special operations.

(4) Applying the "nose-clamp" or "bull-holder". This is an instrument for seizing the nasal septum in a more powerful and secure manner than can be done by the fingers. It varies somewhat in construction, but in principle it is the same. In some patterns it is merely hinged, and the hand maintains it closed (Fig. 1); in others it has a screw (Fig. 2), or a sliding keeper, which keeps it closed (Fig. 3), and this may be supplemented with a spring (Fig. 4). The latter is a good model, though there are others with screw and spring, or rack and spring, to which the preference is sometimes given.

It may be remarked that bulls, and sometimes troublesome cows, wear a nose-ring permanently, which is very advantageous in seizing and handling such animals. The ring is of iron or copper, and jointed, so as to be easily introduced into and removed from the nose (Fig. 5).



I. Nose clamp or bull holder. II. Nose clamp or bull holder. III. Nose clamp or bull holder
IV. Nose clamp or bull holder. V. Nose ring. VI. Nose punch. VII. Alsace ring.
VIII. Alsace ring in position.

A round piece of the nasal septum is cut out by means of the nose-punch (Fig. 6), leaving a hole for its reception. This ring may have a small additional ring within it, in order to attach a rope or the hook of a long pole; or it may have an eyelet or hole in its side for the same purpose. The Alsace ring (Fig. 7) is of this description, and the eyelet may allow the passage of a strap, which is joined by means of a buckle to two other straps passing around and between the horns (Fig. 8). There are various other patterns of rings, but in all the principle is the same.

With certain bulls or cows, a rope passed through the nose-ring would be insufficient to lead or control them. A long pole is, therefore, employed, this being furnished with a spring or spiral hook to hold the ring.

A modification or improvement in this controlling apparatus is that introduced in France by Vigan. This is a pole furnished near one end with a somewhat long, low staple, through which passes a leather surcingle that goes round the animal's chest, the other end is armed with an iron prolongation, about eight inches from the termination of which is a fixed hook descending at a right angle, and which is inserted into the nose-ring, while at the very end is a loop or ring sufficiently large to admit the hand easily (Fig. 9) A strap passing around the horns and this pole attaches it still more firmly to the head. So potent is this instrument as a constraining and restraining apparatus that a young person can easily control a very vicious and vigorous animal.

These means of restraint applied to the head are sufficiently potent to enable the majority of operations to be performed on the bovine species in the standing position. In special cases, however, the operator has to protect himself or assistants from injury by the limbs (particularly the hind ones) of these animals, and various methods may be resorted to with this object.

The principal are:—

(1) Attach the hind legs to each other by means of two hobbles or a piece of rope applied above the hocks.

(2) Carry the tail inside the hind leg which threatens danger, bringing it round the front of the thigh (Fig. 10), where it is firmly held in the hand of an assistant, who stands against the animal's hindquarter. Or a sack or long and wide piece of cloth may be passed round the front of the hind leg, which is by this means held back by one or two assistants.

(3) Place a tourniquet, made of a rope and a piece of wood, or even a twitch, above the hock of this ilmb, around the gastrocnemii tendons, and compress these until they are in contact with the tibia. The pain and restraint prevent the forward and outward movements of the hind leg, which are almost peculiar to the ox species, and are so difficult to guard against.

(4) The hind leg may be attached by means of a side-line round the fetlock, to the forearm of the same side, round the neck, or round the horns.

(5) A pole or plank placed underneath the belly, in front of the hocks, the ends being held by an assistant on each side, prevents the hind limbs being carried forward. Or one end of the plank may be placed on the ground underneath the ox, the other end being held

IX. Pole and ring in position: Vigan's method. X. To prevent injury by hind leg. XI. "Travis" or stocks. XII. Rope in position to throw ox.

by an assistant, who uses the plank as a lever to press the animal against a wall; at the same time, it prevents the extension of the limbs. Placed between the hind legs, this lever will serve to raise either of the hind legs.

(6) The ox may be secured against a wall by means of a rope passed through a ring fixed therein, about the level of the chest, and carried outside the body to another ring inserted in the wall behind the buttocks.

(7) On the Continent of Europe, where oxen are shod, and where, in consequence of being employed as draught animals, they are frequently submitted to operation, a "travis", or stocks, is used to fix them in when they are uncontrollable (Fig. 11). This differs somewhat from that in use for the horse, though, on an emergency, the horse "travis" may be tried.

IN THE RECUMBENT POSITION.

The ox is easily thrown down and secured for operation, the recumbent position which it so frequently assumes being often made available for fettering the limbs.

The apparatus in use for throwing down the horse may also be employed for the ox; but, as a rule, a simple rope is sufficient. Precautions must be taken to prevent fracture of the horns, by having a thick bed of litter or bundle of straw to protect them from contact with the ground.

In all cases the head is furnished with a halter, and it may be necessary to apply the nose-clamp.

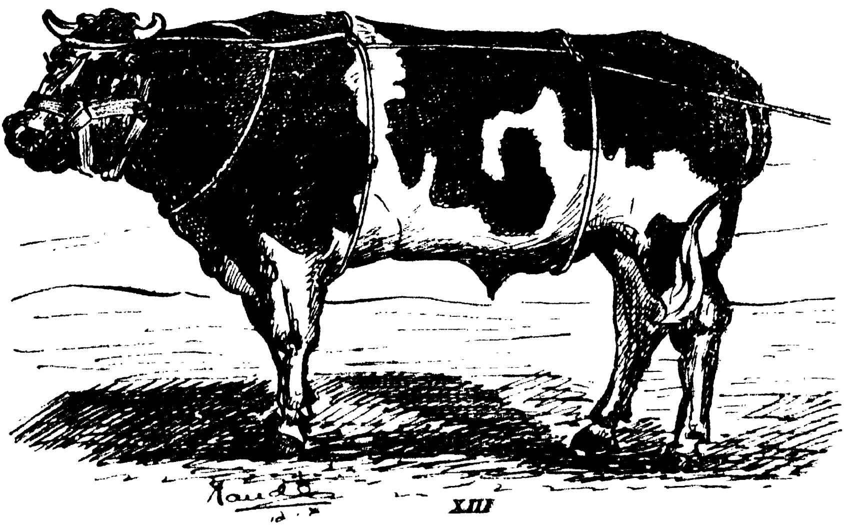
There are various methods of applying the rope, but only two or three will be alluded to here. It may be remarked that if there is any difficulty in placing or maintaining the hobbles or rope around the pasterns, they may be placed immediately above the fetlocks.

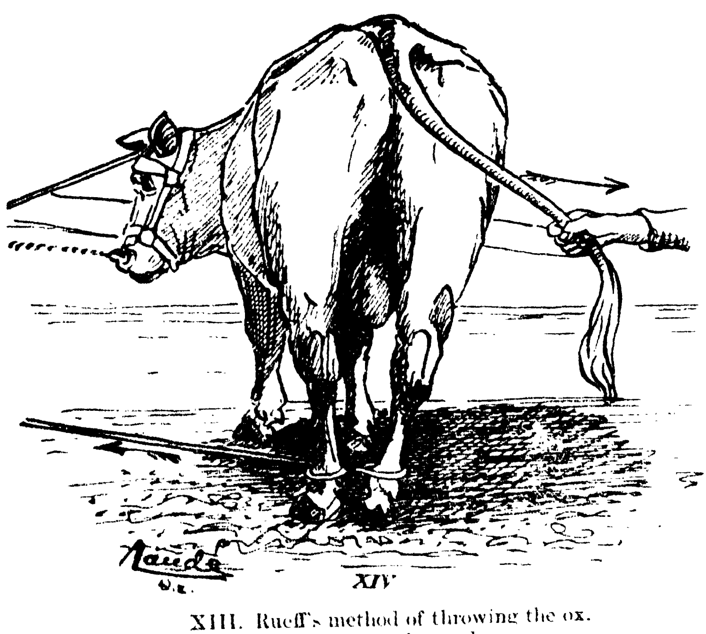
The rope may be provided with a running loop at one end; this is placed on one of the front pasterns; then the rope is carried round the other pastern, back around a hind pastern, forward and around the portion between the front pasterns, and back towards the opposite hindquarter, being disposed throughout as in Fig. 12.

Two strong assistants are often needed for the head, while the rope is pulled backwards by two or three others.

Rueff's method (Fig. 13) is practised by means of a rope about thirty feet in length, at one end of which is a loop that is passed over the horns; the rope is then passed between the horns and along the neck, around which it makes a turn; over the withers, where it makes another turn round the chest; along the back, where it makes a third turn around the flanks; the free end is then carried back on either the right or left side of the hindquarter, according as it is required to throw the ox on its right or left side. One assistant controls the head of the animal, while other two pull the rope backwards steadily and without jerking, so as to compress the body, and in a few seconds the ox will lie down quietly, when the limbs may be secured. To facilitate the gliding of the rope at the points of friction, it may be greased. The rope is disposed as in Fig. 13.

It may be mentioned that the neck rope employed for throwing down horses for castration serves very well for cattle. Another method is: The hind legs are tied together, an assistant holds the





XIII. Rueff's method of throwing the ox.
XIV. Simple way to throw the ox.

head, the rope securing the hind legs is pulled to one side by two assistants, and the tail pulled to the other side by an assistant (Fig. 14).

MANNER OF SECURING THE DOG AND CAT FOR OPERATION.

Of all the smaller domesticated animals, the dog and cat require careful handling in order to guard against injury, and the operator cannot be too circumspect both in seizing and operating on these creatures.

In operating without anæsthesia on the dog, the mouth should always be kept closed by a proper muzzle, or at least a piece of strong tape passed once or twice round the jaws, and tied securely behind the ears.

With some vicious dogs, or even animals otherwise docile or quiet with the majority of persons, the operator (especially if he has operated on the same animals previously) incurs great risk in going near or catching them, and it may be necessary to have them blindfolded before he appears. The safest part by which to seize a dog is the skin on the nape of the neck. But with very savage and dangerous animals there may be risk in this, and the seizure may be more safely effected by means of a long pair of pincers or tongs, the jaws of which are made circular, so as to grasp the neck like a collar; or a stick four or five feet in length, provided with a long wire or stiff cord, forming a running noose at the end, will suffice, the noose being passed over the head and tightened sufficiently to secure the dog, while keeping the latter at a safe distance.

The claws no less than the teeth of the cat have to be guarded against, and this can only be effected by enveloping head, body, and limbs in a piece of strong cloth or canvas, and uncovering only the part to be operated on. If this part be towards the posterior region of the body, the head, chest, and fore limbs may be placed in the leg of a wellington boot.

Experiments with Ostriches—XVI.

THE PLUMAGES OF THE OSTRICH.

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[*This article is in continuation of a series contributed by Dr. Duerden from time to time to the* Cape Agricultural Journal.]

BY the plumage of the ostrich is understood the entire covering of feathers on the bird at any one time.* This is not the same at all periods, for the bird varies greatly in appearance between its chick and adult condition, dependent upon differences in the form, colour, and other characters of its feathers. Visitors to zoological gardens in other countries, accustomed to seeing only the adult ostrich, would scarcely recognize the same bird in its earlier garb.

Four well-marked plumages can be distinguished in the ostrich, namely, the *natal*, the *chick*, the *juvenal*, and the *adult*. These represent four distinct kinds of feather which each feather socket on the bird can produce; but, as regards the bird as a whole, the passage from one stage to another is gradual, as there is no well-defined moulting period involving a complete simultaneous change of feathers. Until the adult plumage is reached there is an intermingling or over-lapping of the feathers belonging to different plumage stages, the older feathers being distinguished by their worn and faded appearance as contrasted with a freshness and perfection in the newer. Many birds, especially in colder regions, vary the character of their plumage between summer and winter, but the slight seasonal changes of South Africa have scarcely any influence on the feathers of the ostrich, and in the adult there is little or no difference in appearance between summer and winter, and a well-defined moulting period has not been established. The change from one plumage to the other is dependent upon age and nutrition rather than upon climatic considerations.

THE NATAL OR BIRTH PLUMAGE.

Like the young of many other birds, the ostrich chick at hatching is already provided with feathers in the form of down. This is the *natal or birth plumage*, and consists of only down feathers,† which are very different from the feathers which will clothe the bird later. Some of these down feathers, taken from the back, sides, and undersurface, are shown in the photograph herewith (fig. 1).

Though differing somewhat in size, the down feathers are of the same character all over the body and wings, a contrast to the various kinds of feathers which the bird produces later. They consist of

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* Among farmers the term plumage is sometimes restricted so as to refer only to the white wing quills. Thus, by an ostrich in "full plumage" is understood one in which the wing plumes are fully developed; when these have been clipped and the quills only remain a bird is said to be "in quills". Throughout this paper, however, plumage will refer to the covering of feathers as a whole.

† Down feathers are sometimes termed *plumules*, but in ostrich feather terminology it is best to use plumule for each barb and the barbules attached to its sides. Thus each constituent of a down feather will be a plumule, as well as each separate part of the flue arising from the shaft in the adult plume.

small tufts of plumules, differing in length, and all starting from about the same level, there being no shaft or stem as in the later feathers.* Each tuft consists of from ten to twenty or more plumules, of which at least four are much longer than the others, being about 2½ inches in length in the side feathers but only about half as long on the back. A plumule is made up of a central axis or barb with small delicate barbules on each side. Towards their free end the larger plumules are without barbules, and on the down feathers of the back are prolonged into a rather coarse, flat, curled, strap-like portion, but on the feathers of the side and below they are narrower and more hair-like. The flat naked parts of the barbs give a bristly, hedgehog-like appearance to the young chick, and stand out conspicuously against the rest of the plumage (fig. 2). Most of the remaining plumules have barbules all along their length and vary in size from an inch and a half to half an inch, while two or three are somewhat shorter. These soft delicate plumules give the downy character to the under part of the plumage of the young chick, though this is somewhat obscured towards the surface by the bristle-like character of the barbs of the long plumules (fig. 2).

Even at the time of hatching it is possible to distinguish in the natal down great differences in the feather-producing capacity of various strains of birds. The down feathers in some strains are almost double the size of the feathers in other strains, while others again are denser and more glossy.

At all ages the neck and head of the ostrich are, as regards their plumage, sharply distinguished from the rest of the body. These parts are sometimes described as naked, but, as a matter of fact, they are thickly covered by feathers which are much smaller than those on the body and wings, and have one or more of the plumules prolonged in a hair-like fashion. These hair-like feathers become bristly on the head, and form a special tuft round the ear-openings, and also serve as eyelashes to the eyelids. The head and neck feathers of the chick are tufts of plumules like those on the body, only much smaller. Examples of the same feathers as they occur in the adult are shown in fig. 12, and are seen to have advanced very little beyond ordinary down. They do not overlap one another like the feathers on the body and wings.

The neck and head feathers vary in colour in the chick, and on the neck the colours are so arranged as to give rise to from five to nine longitudinal dark bands, which are either continuous throughout the long neck or interrupted. Usually the dorsal three or five bands are continuous, while the rest are broken and somewhat ill-defined. They are shown on the chicks in fig. 2. On the head the dark feathers are arranged so as to produce a V-shaped pattern, the angle of the V pointing towards the beak. The sides of the V are either continuous or interrupted, this, according to some, denoting a sexual difference. The general colour effect of the upper part of the head is a rich brown, shading off down the neck. On some chicks a small naked patch occurs on the back of the head and disappears later.

* It has lately been shown that both the shaft and quill are absent from the first down feathers of all birds, the barbs of the down feather passing without interruption into the new feather below. In the large down feathers of the ostrich, however, there is fully half an inch of quill.

The down feathers of the back and sides of the body also vary in colour from light to dark brown or nearly black, and, being intermingled, give a characteristic mottled appearance to the chick, as shown in fig. 2; the feathers on the under surface and in front are much paler in colour, either yellow or white. But newly hatched chicks vary much in the general light or dark brown appearance of the natal plumage as a whole, dependent upon the relative number of the light and dark feathers. In some down feathers, light and dark plumules are intermingled, but usually a feather is either one shade or the other.

Both natal and chick feathers are found covering the outer surface of most of the upper region of the leg, but as the birds become older they largely disappear from this part, leaving the legs altogether naked (fig. 5); impressions of the sockets, however, remain for a long time.

The natal feathers are not moulted in the ordinary manner of later feathers. A week or two after birth they begin to be pushed out of the feather sockets by the chick feathers growing below, the first to appear being those along the sides of the hinder part of the body. The down remains continuous with the tip of the new feather, and there persists until broken or worn off. On the tip of the wing quills the natal feathers remain for six months or more, that is, until the feathers (spadonas) are clipped or the tips worn away (fig. 4).

THE CHICK PLUMAGE.

The chick plumage is that which appears soon after the chick is hatched, and is completed at the age of about eight months, that is, when the wing quills are fully ripe, these being the last to complete their growth. The feathers of this plumage are formed of the ordinary quill and plume, the flue of the latter being equally developed on each side of the shaft or stem. The chick feathers are distinguished from the later feathers by bearing at their tip the natal down feathers, due to the fact that the growth from the birth to the chick feather is continuous;* they also taper towards their free end. The feathers, surrounded by their sheath, begin to make their appearance when the chick is a week or two old, but not all at the same time, the earliest to push out being those over the sides of the hinder part of the body. The flue begins to expand when the chicks are between three and four weeks old.

The chick plumage lasts for a varied period, dependent partly upon the nutritive condition and partly upon the strain of the bird; some of the feathers remain on the bird for a year or more, while others are moulted before the bird is six months old, when there results an intermingling of the chick and juvenal plumages.

The distinguishing feature of the chick plumage, as of the early plumage of many other birds, is its mottled character, agreeing in

* It has recently been shown that in many birds the barbs of the new feather are directly continuous with the barbs of the down feather, no real break occurring between the two. For this reason some writers consider that the down feathers do not represent a distinct plumage, but are to be looked upon as the modified tip of the first true feather (the definitive feather). In the ostrich, however, there is a definite though weak quill, which makes a distinct break between the barbs of the down feather and those of the chick feather. Moreover, the quill of later feathers naturally moulted is also continuous with the tip of the new feather, breaking off from it more readily than do the natal feathers on account of their greater weight.

this respect with the bird plumage. In the chick, however, the mottling is not due to an intermingling of light and dark feathers, but to the fact that the upper part of each feather is light brown, while the lower part is of a dark grey colour (fig. 3). The combination of light brown and dark grey colours gives a peculiar mottled or variegated colour to the chicks for the greater part of the first year, but is more pronounced during the first six months while the feathers are young and fresh. Chicks from different parents vary much in the proportion of light brown and dark colours on the individual feathers, and hence in the general light or dark mottled effect of the plumage as a whole. The dark bands on the neck and head are nearly as pronounced as in the natal plumage.

The various kinds of feathers—body feathers, coverts, and wing and tail quills—now begin to show for the first time those differences which are such a marked feature of the adult. The wing quills (remiges) are from one to two feet in length when full grown, and, like the later wing quills, vary much in length, breadth, and other characters according to the strain. Like the rest of the chick feathers they never form the full rounded tip characteristic of the later wing quills, but taper considerably, hence their technical name of spadona, derived from the Italian *spadone*, the name for a long, heavy sword (fig. 4). The flue is somewhat narrow and thin compared with that of the later wing quills, and light brown above and white or grey below, the white being the more valuable. As the spadonas attain their full length they seem disproportionately large for a chick of five or six months, and when the wings are at rest the feathers of opposite sides may cross over one another under the body and behind the legs. From their nearness to the ground, the tips are more or less worn away as the plumes become fully grown.

The rectrices, or tail quills, are white below, grey above, and tipped with the usual brown, varying very much in the proportions of the different tints. They are much shorter than the wing quills, and, like them, taper towards their free end.

The body feathers of the back and sides vary somewhat in length from different parts of the chick, and also in different strains of birds, but they all narrow towards their free end. The wing coverts and body feathers are of much the same shape, narrowing considerably towards the tip. The lower part of each is a light or dark grey colour, while the upper part is light brown; the boundary between the two colours is irregular, and the proportion of the two colours on each feather also varies considerably. The chick feathers on the under part of the body are white or grey, and do not overlap in the same way as the upper feathers.

The wing quills or spadonas of the chick are practically the only feathers of any commercial importance at this stage, the wing coverts and tails having but little value. The spadonas complete their growth, as regards the whole of the plume and an inch or so of the quill, by the time the chicks are from six to seven months old, and are then clipped for sale. The quill is, however, allowed to remain in the socket in order to complete its development. This requires about two months longer, so that the feather has not actually finished its growth and ripened before the chick is eight or eight and a half months old, by which time all the other feathers are ripened and many have been replaced by the feathers of the next plumage. As

FIG. 1. Natal or birth feathers, consisting of tufts of plumules without any shaft, but with a short terminal quill. Some of the plumules are continued into bristle-like portions which produce the bristly appearance of the chick as a whole. All the feathers of the chick on hatching are of this type.

FIG. 2.—Group of chicks a fortnight old, showing the bristly nature of the natal or birth plumage. Owing to the heat of the day when the photograph was taken the feathers are standing erect and allow the naked parts of the skin (apteria) to be seen, both behind and at the sides.

FIG. 3.—A group of chicks about five months old, showing the mottled character of the chick plumage. Each body-feather is tapering and light brown at the tip, while the rest of the feather is dark grey.

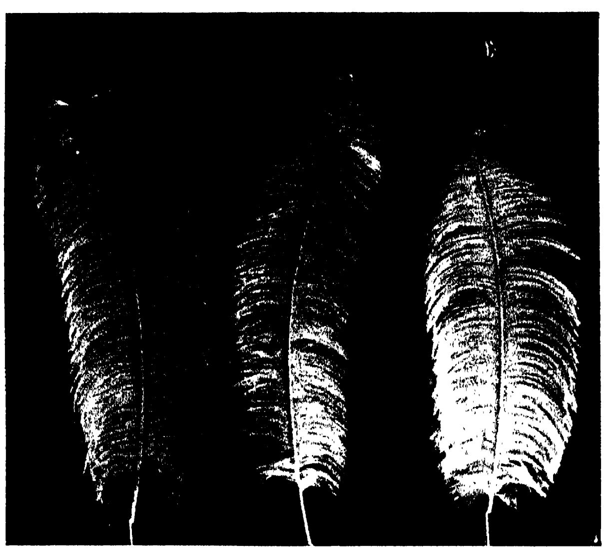


FIG. 4.—Spadonas or spads, the first wing-quills of the chick, clipped at about six months. The middle one still bears the natal feather at its tip.

FIG. 5. Chick a little over six months old beginning to lose the mottled character of its plumage. The juvenal feathers have appeared along the side and are temporarily tinged with white at the rounded tip. The feathers have almost disappeared from the leg; the neck is more uniform in colour than in younger birds, and the ventral body-feathers are light grey. The wing being extended, the naked part of the body underneath is clearly seen.

FIG. 6. A small flock of feather birds mostly in full plumage; note the black body-feathers of the cocks and the drab plumage of the hens. The wing-quills are white in both.

FIG. 7. A pair of breeders, showing the difference in the plumage of the cock and hen. The neck and head are covered with down and uniform in colour, except for the white ring towards the root of the neck in the cock. The leg is wholly devoid of feathers: the large scales along the front of the tarsus can be recognized.

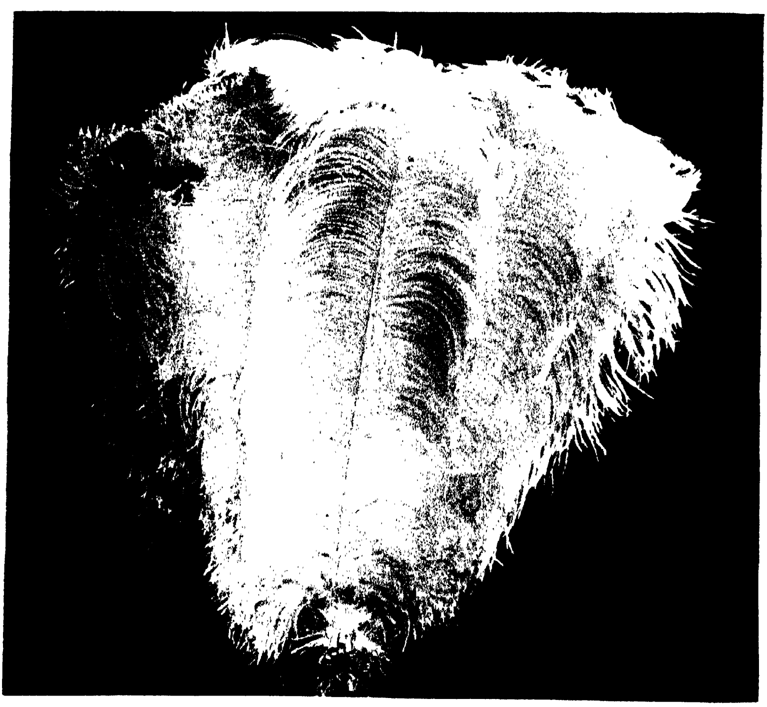


FIG. 8.—A complete clipping of "Feminas", (the wing-quills of the hen, distinguished **by the black** patches at the crown of the plumes. The clipping weighed 9 oz. Grown **by Mr. Jas.** Ford, Kasouga.

FIG. 9.—A complete clipping of the wing-quills, "Primes", of the cock, shewing the pure white of the plumes. The few black and white feathers towards the back of the bunch are Fancies or Byocks. The clipping weighed 9 oz. Grown by Mr. James Ford, Kasouga

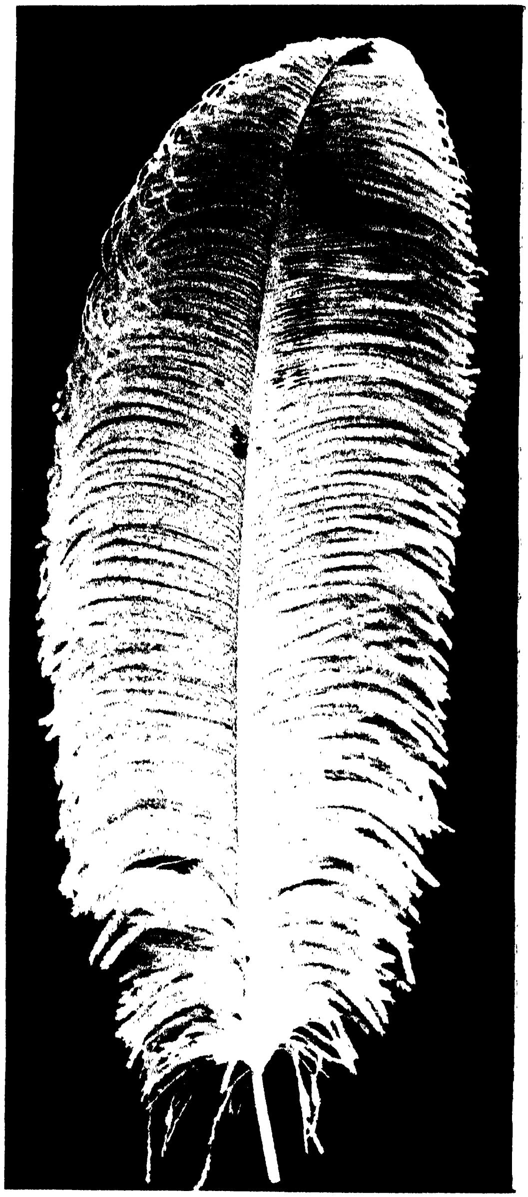


FIG. 10.—A cock Byock or Fancy, a parti-colour of black and white. Three or four of such plumes, often with more black, occur towards the end of the series of wing-quills. Grown by Messrs. Walter Weeks & Son, Sandflats.

FIG. 11. A clipping of black wing-coverts. In clipping, only the first and second rows of wing-coverts are taken.

FIG. 12.—Feathers or down taken from the neck and head of an adult bird. The two larger, one at each side of the group, are from the white ring towards the base of the neck of the cock, the long hair-like middle feather is from the head, and the others from the neck. The "hair" is seen to be a greatly elongated barb.

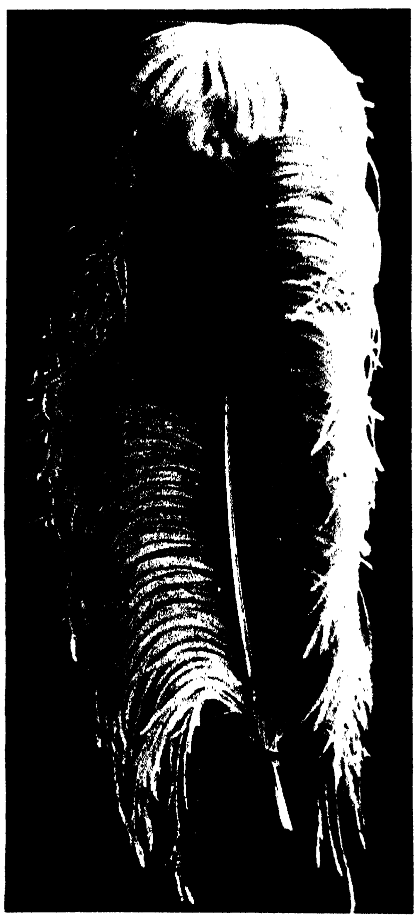


FIG. 13.—A high-grade prime, showing considerable natural curl. Bird owned by Mr. F. W. Holland, Despatch; bred by Mr. Oscar Evans, Melrose.

the feather ripens, the red blood in the central medulla or pith can be seen to recede slowly down the quill, which then becomes white and dry, filled with air, and hollow except for the presence of the horny feather cones which successively cut off the medulla. By the end of two months from clipping, the quills are practically ripe, that is, the blood has altogether left the medulla and the whole quill has become hardened and is narrowed towards its extremity, and may then be extracted without injury to the bird. The plumes have to be clipped before the lower part of the quills is ripened, otherwise their tips would be much worn, and the feather as a whole greatly depreciated in value; this applies also to all the later feather crops. As the severance takes place through the upper ripened part, above the blood in the pith, there is no haemorrhage, which should be avoided for the sake of the later feather.

As regards the feathers of the chick plumage there is no reliable sexual difference in the ostrich, nothing to indicate which are cocks or hens, a matter often of much importance to the farmer. Usually, however, the spadonas from cock chicks are lighter than those from the hens. To determine the sex with certainty, however, other characters are available at this time.

The wing plumes being clipped at about six months, the tail quills and two rows of wing coverts are allowed to ripen, and are plucked at from seven to eight months; being of little value they are rarely or never clipped. All the other feathers of the chick plumage are allowed to follow the natural method of moulting. The process is carried out at very different times in different parts of the bird and will be described in connection with the juvenal plumage.

From five or six months onwards the chick plumage begins to lose its primary characteristics. Many of the feathers are early pushed out by those of the juvenal plumage, and, as the latter are larger and uniformly steel grey, they show conspicuously among the mottled chick plumes. The chick feathers drop out first in the hip region by the time the chick is five months old, that is, before some of the other feathers of the plumage are fully grown. The chick feathers which are not replaced begin to lose their freshness of colour from about six months onwards, the lighter brown at the end of the feathers especially disappearing. In the wear and tear the tips are generally worn away, and the adhering natal feather is broken off.

The general colour effect of the chick ostrich, in both the natal and chick stages (figs. 2 and 3), would appear to have a protective significance, the light and dark mottlings closely resembling the dry veld or grass on which the chicks usually crouch in nature. When at all alarmed, chicks suddenly scatter and then drop flat on the ground, with the neck and head extended, exhibiting death-feigning to a greater or less degree, and in this condition all farmers have noted the difficulty in recognizing the chicks on account of the close resemblance which they bear to their surroundings.

THE JUVENAL PLUMAGE.

The third or juvenal plumage represents an intermediate stage between the chick and the adult plumage. It does not, however, follow immediately upon the second or chick plumage, as moulting is never uniform over all the body. The body feathers of the chick

are pushed out gradually, one at a time, not simultaneously, from four or five months onwards, and are replaced by larger feathers of an altogether different type. Instead of being mottled, the new feathers are of a uniformly dark grey or slate colour, often tinged with white for a time at the extreme tip, which is no longer tapering but rounded (fig. 5). The juvenal feathers first appear along the sides of the hinder part of the body, a number coming out about the same time. Often the chick feather will remain attached to the tip of the new feather, hanging loosely, and only breaking off after the juvenal feather has protruded for some distance. After a number have grown out at the sides others begin to appear along the back, and then odd ones push out over the body generally. Some chick feathers may, however, remain in their sockets until the birds are twelve months or more old, those around the base of the neck being the last to drop out. The rapidity of the change is partly determined by the nutritive condition of the bird and partly by the strain.

The chick, as a whole, begins to lose its mottled appearance from six to nine months onwards. This is partly due to the replacement of the lighter tipped chick feathers by juvenals of a uniform hue and partly to the fading and wearing away of the light brown tip of the old ones remaining. By the time the chicks are a year old, nearly all the body feathers show the slate or drab colour of the juvenal plumage, those of the cocks being somewhat darker than those of the hens. All the feathers of the plumage, however, are not fully ripe until the birds are about sixteen months old, as usual the last to ripen being the wing quills. In the wild chick some of the wing quills would probably ripen much later than this, for, in nature, the first quills are not got rid of all at the same time as is the case under farming conditions.

The ventral or under body feathers of the juvenal plumage are white or light grey in both the cock and the hen, but by sixteen months some of the true blacks are beginning to show in the cocks, and, ultimately, the ventrals are all black in the cocks but remain white in the hens.

Under farming conditions the quills of the spadonas are all pulled out at from eight to nine months, and the wing quills of the juvenal begin to show in about a month's time and have been found experimentally to grow at the rate of from one to two inches per week. The juvenal wing plumes, known as "first-after-chicks", are sometimes uniformly white in the cock, though usually they are tipped with black. They are much larger than the spadonas of the chick and more rounded at the tip. Rarely some of the juvenal wing plumes in the hen are pure white; generally they are tipped with black or have an irregular admixture of grey, and though sometimes longer, are usually not as dense nor as valuable as those of the cock. The juvenal wing plumes are much larger than the spadonas, but the wing plumes do not reach their full size until the next stage or even later. As a result of the highly stimulating conditions of artificial feeding, it is found, however, that the plumes tend to attain maturity at the juvenal stage, and advance but little afterwards. This is more especially the case in some strains than in others.

The juvenal tail quills of the cock are now white or tinged with light or dark brown; those of the hen are usually a darker or lighter mottled grey. The juvenal upper and under wing coverts are, like

the body feathers, grey or blackish, a little darker in the cock than in the hen. The small black feathers of the neck and head now disappear to a large extent in both sexes, so that the dark longitudinal bands of the chick are scarcely recognizable. The covering of the head and neck becomes a pale grey, almost white in some strains, and often a pure white ring intervenes between the neck and the body feathers.

With the juvenal plumage slight sexual distinctions begin to manifest themselves. Generally the body feathers are darker in the cocks than in the hens; the ventral or under feathers are white in the latter but change to black in the former; the wing quills of the cock are pure white, usually tipped with black, while those of the hens are nearly always tipped or tinged throughout with grey. The plumage distinction between the sexes is, however, by no means so decided at the juvenal stage as later on, when the true blacks appear in the cock while the body feathers of the hen retain the dark grey or drab.

ADULT PLUMAGE.

The adult plumage in the cock ostrich is altogether different from that of the hen; even at a glance the two sexes are conspicuously unlike (fig. 6). The full distinction is reached when the birds are about two years old, but great variation occurs, some strains completing their changes much before others. The adult cock bird is characterized by the possession of black body feathers and coverts, the hen by drab body feathers and coverts (fig. 7). The difference may perhaps be better appreciated by saying that the hen retains throughout life the same dull grey colour which she had in the juvenal plumage, while the cock passes through the juvenal to a stage where the feathers are black. Both sexes are practically alike in colour as far as the juvenal plumage, and the hen retains the sombre colour throughout life while the cock goes a stage further in which he is more conspicuous. Similar sexual relationships hold in many other animals, the female remaining at an earlier developmental stage which is common to both, while the male assumes another more slowly garb, differences which may perhaps have a bearing upon questions of sexual selection and protective resemblance.

In young cocks there is a marked contrast between the grey or drab feathers of the juvenal plumage and the first black feathers of the adult plumage. The time at which the true blacks show themselves varies much in different birds, and as these feathers are of a greater value than the drabs, the earliness is a matter of some economic importance. The blacks on the sides will sometimes appear before the birds are a year old, but usually they are later, though before the end of two years all the body feathers and coverts will be black. Often in birds between eighteen months and two years a few odd faded feathers of the juvenal plumage are conspicuous among the fresh true blacks.

With the fourth plumage, "second-after-chicks", the valuable wing quills of both the cock and the hen have usually reached their full size and show their best characteristics. The plumes attain ripeness by the time the bird is about two years old, though in forward birds the quills also will be ripe by this time. With the exception of a few feathers towards each end of the wing, the wing quills are pure white in the cock ("primes" or "whites"), but

are usually tinged with grey or black in the hen, either throughout or only at the tip ("feminas") (*cf.* figs. 8 and 9). The detailed characters of these feathers, which determine their value from a commercial point of view, will be described later.

The tail quills of the adult also differ in the two sexes. Those of the cock are usually white below and yellowish brown above, while in the hen they are a mottled light and dark grey, the proportions of the light and dark areas varying much. At first sight the brown colour of the cock's tail feathers might be supposed to be merely a discoloration from dragging over the ground, but it is found to be the true natural colour of the plumes in most cases, though some are nearly pure white. As the cocks generally carry their tails erect or pointing forwards, the light brown feathers stand out very conspicuously against the blacks of the body.

Except as regards position the passage from the wing and tail quills to the coverts and body feathers is gradual. Towards each end of the series of wing quills three or four of the plumes of the cock, instead of being pure white, are a parti-colour of black and white. These are technically known as *byocks* or *fancies* (fig. 10), and are very attractive plumes, realizing good prices. The hen likewise shows hen fancies, a mixture of white and grey, similarly with the two rows of wing coverts. While usually wholly black (fig. 11) or drab, many are white in places, particularly towards each end of the plume. Likewise the white and brown tail quills of the cock are not succeeded by wholly black feathers but by parti-coloured feathers, in which the white, brown, or black are displayed in varying proportions. These intermediate tail feathers are known as "black butts".

As previously stated, the neck and head of the ostrich are covered with small down-like feathers, giving these parts an altogether different appearance from the rest of the body (figs. 6 and 7). Examples of the neck and head feathers as they occur in the adult ostrich are shown herewith (fig. 12). In most cock birds a conspicuous ring of small white feathers occurs towards the base of the neck, that is, where the black body feathers pass into the grey neck feathers (see the cock in fig. 7). Two of these are shown in fig. 12, and reveal that a few of the barbs at the tip are prolonged beyond the others in a hair-like fashion. This character becomes more emphasized in the feathers covering the rest of the neck and head, as shown in the same photograph. They are down-like in character, the quill and shaft undeveloped, the barbs are delicate and hair-like, and the central barb is prolonged much beyond the others. Owing to these long barbs the neck and head seem as if provided with a sparse covering of hair, which is especially concentrated as a circular tuft around the ear-openings and also round the eyelids, forming the eye-lashes.

The under or ventral body feathers are small and black in the cock but white or grey in the hen. In the adult the feathers have all or nearly all disappeared from the upper part of the leg, which is then naked throughout its length: the original feather sockets show, however, for a long time.

The third and fourth clippings are generally considered to represent the best efforts of the ostrich in the direction of feather production (fig. 13). The plumes do not improve from this time onwards, so that the farmer is now fully aware of the feather value

of his bird. Ostriches which are well treated continue to produce feathers of the same quality for a number of years, well authenticated cases being known of birds thirty-five to forty years old which still produce a good plumage. Where, however, the production is forced, as in securing a clipping every eight or nine months, some birds are found to deteriorate after four or five years, but great variation is observed in this respect. The plumes also depreciate rapidly if the practice is followed of drawing the feathers or quills before they are fully ripe. A bird almost useless for feather production may yet be valuable for breeding.

A few general considerations call for notice. The approximate ages given above at which the wing plumes attain ripeness only apply to ostriches under domestication, in which evenness and greater frequency of growth is attained by pulling the quills immediately on attaining ripeness. By this means clippings are secured at six months, at fourteen months, and at about two years, the last representing the adult plumage. When left to themselves, that is, when not drawn artificially, the quills are not all moulted at the same time; some will remain in their sockets for months longer than others and hence delay the plumage stage of the particular socket The natural order according to which the various plumes appear has not yet been determined, but it is well established that the feathers towards both ends of the wing develop in advance of those in the middle. It follows from this irregular moulting that, in a state of nature, the time at which all the wing plumes, tail plumes, and even the coverts have reached the adult plumage stage will be much later than that given above. In a wild ostrich only a few of the wing plumes are growing at any one time instead of the full number as in the domesticated bird, where the growth is regulated artificially.

Building a Cattle-Dipping Tank.

By WM. TAYLOR HESLOP.

CALLED upon to build a dipping tank for cattle in Natal, the writer, because of his occupation, approached the subject from the standpoint of an engineer rather than from that of a farmer. He therefore drew on the practical experience of local farmers who are users of tanks, as far as shape and adaptability for the operation of dipping are concerned, and upon his own experience for the structural features herein discussed.

Great care is required in the construction of a dip before the owner can feel certain that it will be perfectly water-tight and free from liability to crack, and to ensure this, attention needs to be given to very many factors with which many farmers are unfamiliar. The writer trusts that the following notes may be useful to some of them.

Site.—The extremes between the dryness of winter and the soaking wet of summer in Natal necessitate care in the selection of a site. Surface considerations demand proximity to water and a gentle sloping surface for the draining race; but the nature of the ground is of greater importance. The heavy black clays, so common in Natal, expand in summer and contract in winter very considerably, and should therefore be avoided. Naturally also the farmer wishes to avoid the labour and expense of blasting an excavation in the solid rock. Before finally deciding on a site a small hole should be dug to a depth of 8 or 9 feet to ascertain the nature of foundation available. If expense is to be avoided it is important that the strata within 3 feet of the surface should give good support to masonry as well as that at a greater depth. If there is a good foundation 9 feet down, but a bad foundation to build upon between the depths of 4 and 8 feet, then, either before completion or at the change of the season, possibly on the approach of dry weather, the shallow ends of the tank will settle down and the walls will crack transversely. On very many farms a layer of *oud klip* or nodular ironstone is encountered within 3 feet of the surface. Where this is the case it offers a good support to the shallow ends of the tank. A loamy, or even sandy, foundation at depth, is always better than a plastic clay. If the upper foundations (between 3 and 8 feet deep) are at all doubtful, either select a fresh site, or build each end of the tank before connecting the masonry with the central portion, allow a day or two for the weight to settle down, and then connect the masonry with the central portion. Where the material used is concrete, a few longitudinal tiers of scrap iron, such as old fencing posts, old tyres, or even strong fencing wire, may be inserted to strengthen the concrete against tensile strains and reduce the risk of transverse cracks.

Materials.—The choice of materials for the construction of a dipping tank will naturally depend upon what is locally available.

Where a good freestone is available on the farm, it will prove to be the most economical material to use. It can be roughly dressed on the inside of the tank so that the plastering of cement will be fairly even and regular. If well-burnt bricks are easily obtainable, they may be used, but care is necessary to ensure that they are thoroughly well burnt—clinker burnt, in fact—that they are not too porous, and do not contain too much alkaline salts, which, on contact with moisture, will "fret" out of the bricks and possibly break away the cement plaster. No farmer should attempt to make a kiln of stock bricks from surface clay on his farm for this purpose. If whinstone is used, great care is necessary to ensure that all the rusty faces or cleavage planes are carefully hammered off, as the cement will not adhere to them, and leakages, if not cracks, are likely to result. Whinstone can only be dressed very roughly with the hammer, and, consequently, it is difficult to build it with a good inside face which will take an even coat of cement plaster, and, in consequence, the builder finds that it requires quite a large amount of cement for plastering only, and the plaster is more liable to break away from the whinstone than from freestone or well-burnt brick.

For average conditions throughout Natal, probably concrete will be found as generally suitable as any other material. It has the further advantage that, if proper care is taken, it may be constructed by any intelligent farmer without the assistance of skilled labour.

Whether concrete, freestone, whinstone, or brick is used, it is of the greatest importance that only a first-class brand of cement, such as White's, should be made use of. Cheap Belgian or German cements should, in particular, be avoided. A first-class cement will neither expand nor contract in setting. A cheap inferior cement may do either, and, if so, the dip on which it is used will not be watertight. Care is equally necessary that the sand used is clean and free from all clayey matter. If sand containing clay or mud is used, contraction will take place when the mortar sets, and cracks will ensue.

Design of Dip.—In the design of a dip the two main features to be kept in view are (1) suitability in shape for properly submerging the cattle and (2) economic construction and permanent stability. Concerning the first point, it is necessary to ascertain and utilize the experience and opinions of the practical farmers who are already using dips and who have found out the defects of their own or ascertained where improvements might be made. The second point more particularly concerns the practical engineer or builder.

Nearly all the plans hitherto published show the cross-section of the dip from 3 feet 6 inches to 4 feet wide at top and tapering evenly to a width of 2 feet to 2 feet 6 inches at the bottom, and from 8 feet to 9 feet in depth. It is obvious that the widest part of an animal that must be provided for is not the body, but, with large-horned stock, the distance between the extreme points of the horns, in fact, with Africander cattle it may be necessary, in some cases, to cut the horns in order to get them into an average dip. When the animal plunges into the dip, it is quite likely that the head and horns may go down to

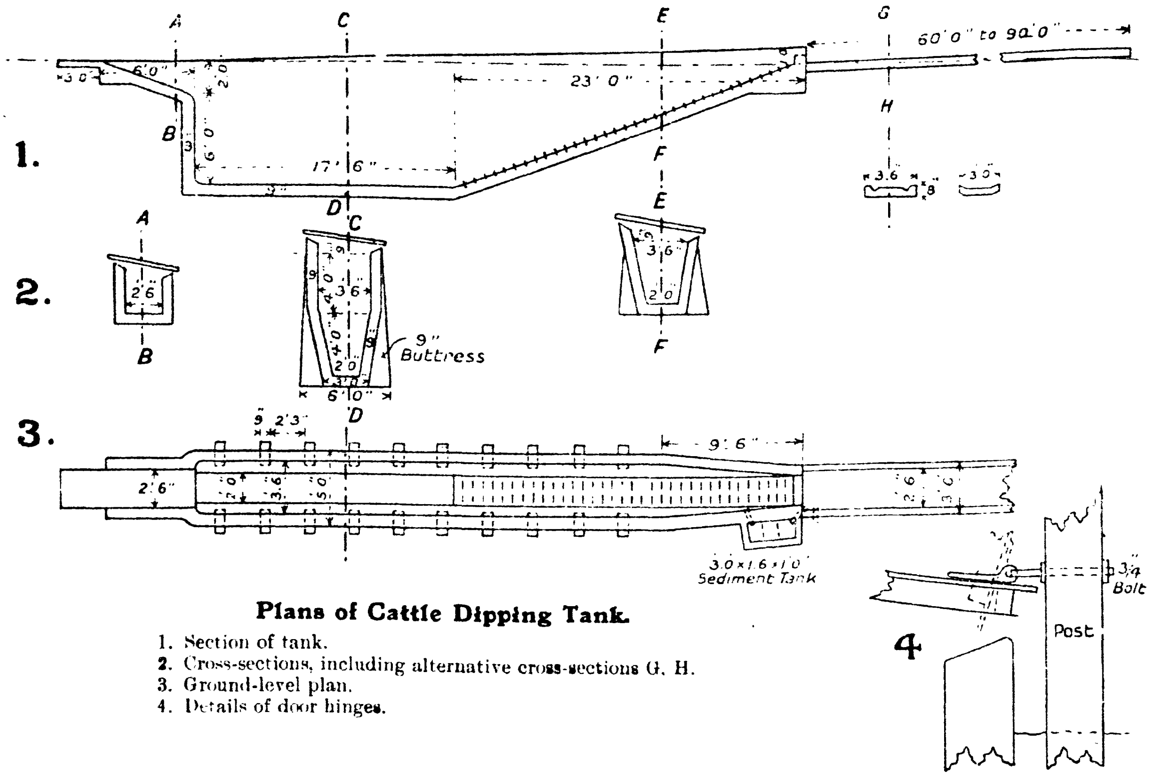
within 3 feet of the bottom of the dip. If, therefore, the dip is unduly narrowed at the above depth, an ox projected with considerable force into the dip, between tapering walls, may get its horns jammed between the walls and possibly be drowned. In certain cases brought to the writer's notice, animals have got fast and have only been liberated with difficulty. Further, with tapered walls as above, the outward overhang is very considerable. From a mechanical point of view we have to provide against an outward pressure from the dip, as well as the earth pressure towards the dip, unless the natural strata are sufficiently strong to withstand it. Where the side strata are of clay or loam there is always a certain amount of contraction in dry weather, and, unless fortified with outside buttresses, there is a danger of certain types of dip giving way at the change of the season.

Bearing in mind these two important points, the writer constructed his tank with the whole of the taper in the bottom 4 feet, and then continued the walls vertically upward for the balance of the height, finishing about 1 foot above surface level, and instead of building the walls 14 inches thick, they were kept down to 9 inches and buttresses put in at 3 feet intervals to give the necessary stability. The in-slope is made rather narrow, and cemented smooth to prevent the animal from getting a good foothold, and also to check any tendency that the animal may have to take a sideways leap in attempting to avoid the water. The fencing must also be continued far enough to prevent this, or else the side walls may be carried up to effect the same purpose. The bottom of the in-slope, where it turns to the vertical drop, should also be rounded off to prevent any unnecessary grazing of the animal's hocks when it slides in.

The out-slope is usually made with steps, but these require a good deal of labour to make; the writer carried it up with an even slope, and bedded old fire-bars, or any old scrap iron, into the concrete at 9 inch intervals, and projecting about one inch above the cement. This arrangement is more durable than steps, and more easily constructed. If scrap iron is not available, stone could be utilized in a similar manner. No particular purpose is served by making the steps wider at the top than at the bottom, and they are therefore kept the same width all the way up, the body of the tank likewise narrowing towards the end. The walls of the dip are also 1 foot higher at the outward end, as the forward plunge of the animal sends a rush of water in that direction.

In case of an animal getting into difficulties, or, as with calves, turning round and attempting to swim back, it is desirable to have one side of the tank easily accessible. With that object in view, the cover is altogether on one side, and the wall on the other side is carried a foot higher to give the requisite slope for the galvanized iron roof. This also reduces the cost of the roof. The loss of solution by side splash is very insignificant.

The draining race, 90 feet long, was made of concrete from 6 inches to 9 inches thick laid on the surface of the ground. It was made with a camber in the centre and a sluit on each side. The



Plans of Cattle Dipping Tank.

1. Section of tank.
2. Cross-sections, including alternative cross-sections G. H.
3. Ground-level plan.
4. Details of door hinges.

object of this is to avoid, as far as possible, the pollution of the solution with the dung from the animals, which thus falls in the centre of the road where it is dry, instead of falling amongst the solution in a central gutter. This style of race involves the use of rather more cement than the usual race requires. As the foundation for the race is rarely good, it is advisable to divide it into 6 feet lengths by narrow strips of wood. If a settlement takes place it will do so on the line of the wood strip instead of breaking up the concrete.

Construction.—After having put down a small trial hole 9 feet deep to test the formation, it is necessary to peg out the ground for the excavation with great care, otherwise unnecessary ground will be taken out, and it will have to be filled in with concrete. The less the care used the more cement will be needed. The hole should be cut out rather small at first, and then the sides may be dressed down carefully, using a plumb-bob for the upper portion and a wooden template for the lower tapered portion. After cutting out to the neat dimensions, a series of vertical cuts may be made in the sides for the purpose of forming the buttresses. Extra care taken with measurements at this stage will save both trouble and expense later on.

For the template or mould for shaping the inside of the tank, we require a few lengths of 4½ inch × 2 inch deal to make four frames shaped to the cross-section of the lower portion of the tank. Each frame should be 1 foot 6 inches wide at the bottom, 3 feet wide at top, and 4 feet high. This allows for a backing of 3-inch deals, of which six or eight 9 inch + 3 inch × 18 feet should be provided. The frames should be braced diagonally to keep them in shape. A few pieces of flooring board will be required to close up the end of the first sectional frame, in order to provide for the filling in of the piece of vertical end wall at the in-slope of the dip.

To mix the concrete, empty the first cask of cement on to some smooth surface—preferably a sheet or two of flat iron or an old door—knock out the bottom of the cask and use it as a measure, first for three parts of clean sand and then for six parts of stone, broken to pass through a 2-inch ring. Freestone, whinstone, or even *oud klip* may be used so long as it is washed clean from all clayey matter. Mix thoroughly, whilst dry, by turning over three or four times with shovels, then add water until it is thoroughly wet, mixing again meanwhile. The cement and sand, when mixed, should be of the consistency of cream. With this the 9-inch floor of the tank may first be put in, along the bottom and three-parts of the way up the outslope. After a couple of days the templates may be placed in position, care being taken to place them exactly as required and to secure them by means of a few pieces of wood nailed to the top of the template and pressing against the sides of the excavation. After the backing deals have been fixed, the concrete can be thrown in and gently rammed. Care must be taken, whenever concrete is placed on places that are already dry, first to wash them down thoroughly with water; and it is also advisable to run on a little cement and sand mortar without any admixture of stone before proceeding with the next batch.

After completing one portion, cover it with wet sacks to protect it from the sun, and allow it to dry as slowly as possible. In drying, cement continues to absorb water for some time, and if the sun has already dried up the available moisture the setting of the concrete is imperfect.

As each portion is completed, the frames and backing deals must be moved, first to the slope and then to the upper portion of the tank. Then, leaving a temporary gap at points *a b* and *e f* (see plan), the two ends may be completed. When these likewise have settled, these gaps may be filled up. If the foundation at each end is particularly good, these temporary gaps may be dispensed with.

The sediment tank at the top of the out-slope serves to catch any dirt from the draining race, and also provides a wider base for that end of the tank. An extra 1½-inch pipe should be provided to run off storm-water when the dip is not in use. In the first instance, the floor of the out-slope should be laid about 6 inches deep, the additional 3 inches being laid with the fire-bar or tyre-iron steps.

After the templates or forms have been taken out, the inside of the tank should be carefully pointed, or if necessary given a thin coat of cement plaster, always carefully wetting the surface before applying the cement.

Before filling the tank with solution it should invariably be tested by filling with water, and by allowing a day or two for the concrete to absorb water any leakage may be checked. As an additional precaution against leakage, the inside may be coated with hot tar to a few inches above the water level. This is an excellent preventive of small leakages, which, when spread over a long period, might result in the loss of considerable quantities of solution.

The roof should be made in lengths of 8 feet by 6 feet wide, fastened with roofing screws on to 3-inch by 2-inch framing. The hinges should be placed above the iron, not underneath, otherwise when the doors are open the splashed solution will fall outside the tank. The hinges may be made by any blacksmith, and supported by posts instead of being set in the concrete wall of the dip, as per sketch plan showing details of door, both open and shut. The subject of fencing and gates was fully dealt with in the November issue of the *Natal Journal* and need not be repeated here.

Heredity.

By THOMAS H. DALE, M.R.C.V.S., Government Veterinary Surgeon, Potchefstroom.

DURING the last decade the study of genetics has assumed the status of a science, but while much light has lately been thrown on the mysterious laws of heredity this light has also served to emphasize the incomplete character of our knowledge of the subject. Until quite recently the methods of the average breeder have been almost entirely empirical; he has mated together those that seemed to him to combine those points which he most desired, the result being an interesting gamble which added zest to the enterprise but not always grist to the mill. Finality, however, is still afar; the new science is still in its swaddling clothes, but giving promise of the future as the healthy child foreshadows the virile man. It will be impossible in an article of this description to do more than indicate what has been done, but if no other result is achieved than to awaken an interest in a subject which is of vital interest to every stock-breeder in South Africa, good shall come of it. During many conversations with breeders and farmers in the Transvaal the writer has been struck with the confusion of terms which exists. Atavism, Telegony, Mendelism, convey little to the average owner of stock, and here it may be pointed out how very regrettable it appears that it has been found necessary to coin and introduce such ugly and unweildy terms, as for instance, " heterozygote ", " allelomorph ", and the like, and in this paper an endeavour will be made to avoid as much as possible the use of terms of this description. The disciples of Mendel appear to be the greatest sinners in this connection; the older " seekers after light " appear to have got on very well without this coinage. Before proceeding further it may be profitable to discuss some of the older theories, many of which have been abandoned by scientists as untenable, but which are still firmly believed in by a large majority of breeders and fanciers. The oldest perhaps of these is

MATERNAL IMPRESSION.

The belief in the theory of maternal impression has been universal from the earliest times, as is evidenced from the obvious allusion to it in the Book of Genesis, where the patriarch stock-farmer Jacob " took him rods of green poplar, and of the hazel and chestnut tree, and pilled white strakes in them, and made the white appear which was in the rods. And he set the rods which he had pilled before the flocks in the gutters in the watering troughs when the flocks came to drink, that they should conceive when they came to drink. And the flocks conceived before the rods, and brought forth cattle ringstraked, speckled, and spotted." And if it appears to be certain that this belief extended into the ages antecedent, more certain it is that it has extended to the present day. The belief has extended to all classes, and is applied not only to the domesticated animals but to the human race itself; this is of course as it should be, for both being animals, any law which applies to the one should apply to the other. It is quite

a common thing to find a shock, fright, or vivid mental impression held to be accountable for birthmarks, malformations, monstrosities, peculiarities of colour, hairiness, and in fact for any and every physical abnormality. Many breeders, especially in Scotland and the north of England, firmly believe in it, and all manner of tricks are resorted to, to attain some desired end. For instance, a cow has previously thrown calves of an "off" colour; it is desired that she should have a red calf. The animal is blindfolded and mated; after the bull has been taken out of sight she is uncovered, and the first object her eyes fall upon is a red heifer, which had previously been brought there for the purpose. Many breeders assert that they secure the desired result; in many cases they are men whose word cannot be doubted. It may of course be only coincidence. It may be that many failures along the same lines have been forgotten, or that a different bull had been used that was prepotent for red, or, again, it may have been merely coincident variation meaning nothing, for it is a matter of everyday observation that amongst the offspring of the same father and mother, come many variations, especially in regard to colour; even in the same litter we can see this. But unquestionably are there well-recorded cases which cause the unbeliever to pull up and think. The writer knows of a case where a pregnant mother, accidentally stepping on to a piece of sharp metal, wounded her left foot severely; on the birth of the child a vividly coloured birthmark was found in exactly the same situation as the wound. It is difficult to ascribe this to coincidence or any of the possible explanations enumerated. At the same time the *modus operandi* is difficult to understand. As Thomson says: "Sometimes, indeed, the maternal impression theory is demonstrably untenable when the impression occurs late in pregnancy, for most of the great events in development occur very early. We have also to remember the multitude of cases in which in spite of very startling maternal experiences the offspring is quite normal. In comparison with this multitude of cases where nothing happens the number of really puzzling cases is really very small, and may be dismissed as coincidences. At the same time it is always unwise to speak of impossibilities in regard to matters which are inadequately known and imperfectly understood." There can be no doubt that the majority of the statements made and cases recorded will not bear the light of investigation. Many are too wild and fantastic to receive credence; others again, as already indicated, require a lot of explaining away, and it will at the present time, perhaps, be best to say that we do not know, for it is folly to say that it is impossible, although it has not been proved.

TELEGONY.

Telegony or "infection" is commonly referred to as "throwing back to a previous sire", and may be defined as the supposed influence of a previous sire, that is to say, where an offspring resembles a sire which, though not its father, had been previously mated with its dam. The belief in this doctrine is almost as common as is that in maternal or mental impressions. It is quite a common belief amongst dog fanciers and others that if a fox terrier has pups to a dog of another breed and is then mated to a fox terrier that the offspring, instead of coming pure, will show evidence of the previous mating, the inference being that the bitch is spoiled for the further breeding of pure stock.

Poultry fanciers again often assert and many believe that if, for instance, a white leghorn cock is mated to hens of another breed, not only are the hens spoiled for breeding pure stock, but that the white leghorn male if mated to white leghorn hens will taint the progeny: in other words that the resultant chicks will show evidence of the time when the sire was lord of another harem. In neither instance, however, do the facts confirm the popular belief. The writer has had many opportunities of making experiments with dogs, poultry, rabbits, guinea pigs, rats, and mice, and though many experiments have been made, covering a period of over twenty years, not a single instance could be noted which could even be twisted into evidence favourable to the infection theory. Another common belief is that if a mare has produced a mule and be afterwards mated with a horse the progeny will give evidence of the fact by possessing characters of an assinine nature, either abnormally long ears, " donkey " hoofs, or the existence of leg, shoulder, or dorsal stripes, or a combination of some or all of these, but these beliefs are again opposed to the experience of observant breeders of mules on a large scale. Cossar Ewart, quoting information received from the Baron de Parana, of Brazil, says: " I have many relatives and friends who have large establishments for the breeding of mules where they obtain from 400 to 1000 mules in the year; in all these establishments a pure-bred foal has never been produced resembling an ass or a mule ", and this is also the experience of other large mule breeders in other parts of the world. At the recent sale of pure-bred stock held at the Government Experimental Farm, Potchefstroom, a prominent farmer remarked that it was a pity that, in the majority of cases, the bulls would be run with half-bred and mongrel stock and thus ruin them for getting pure-bred calves afterwards. This is again a fallacy and is opposed to the experience of all careful breeders and stockmasters, and in instances which appear to indicate that this elusive influence has been at work the explanation will probably be found in the fact that some other bull was responsible for the calf. In 1905, or thereabout, Professor Cossar Ewart, of Edinburgh, decided to make a number or series of experiments likely to give telegony the best possible chance of declaring itself, and to this end he obtained a male zebra which was mated to a number of mares of different breed and type, about twenty hybrids resulting (some half-dozen of these are illustrated in an article by the writer on " The Utility of Zebra Hybrids ", which appeared in No. 8, Vol. 2, of the *Transvaal Journal.*) The following season the mares were mated with stallions of their own species, the progeny in no instance showing any indication that the dam had previously been mated with a zebra. Many eminent biologists of repute have, however, declared in favour of the theory of telegony, including such well-known names as Darwin, Spencer, and Romanes, although it is true that Darwin some time before his death had changed or modified his opinion, having come to the conclusion that it very rarely occurred. There can be no doubt that the one and only way to prove or disprove a theory, such as the one under consideration, is by direct and careful experiment, conducted on scientific lines. The average sample of evidence usually proffered is invariably unsatisfactory and often unreliable. As an illustration there is the classic instance of Lord Morton's mare, which produced a hybrid to a quagga, which plainly showed very decided indications of its mixed origin. Having passed

out of Lord Morton's hands, the dam was mated with a black arab horse and produced a filly, and in a letter written by Lord Morton and addressed to the President of the Royal Society, describing her mane, Lord Morton says: "That of the filly is short, stiff, and stands upright, and Sir Gore Ousley's groom alleged that it never was otherwise". However, in a painting of the filly by Agasse (in the London College of Surgeons Museum) it is represented as hanging lank and close to the right side of the neck. From the evidence available, the painting appears to have been executed about a year after Lord Morton's communication, and it is hardly likely that a careful painter of repute would have failed to note an upright quagga-like mane such as Lord Morton describes. There can be no doubt that at the time of Lord Morton's visit the filly had a mane as described in his communication, but there was ample time for it to have grown, so that the evidence is too unreliable to be accepted and therefore cannot be taken as a proof of telegony; in fact there is very little evidence of a reliable nature in support of telegony, but much solid experimental work has been done which discredits the theory, and in discussing the Cossar Ewart experiments, Professor Thomson says: "The experiments proved this, at least, that telegony does not generally occur, even when what were considered to be favourable conditions were secured; indeed, anything suggestive of telegony occurred only in a very small percentage of cases. Moreover, where peculiar phenomena of inheritance were observed, they seemed to be readily explicable on the reversion hypothesis."

SATURATION.

The saturation hypothesis, although of more recent date than those already discussed, also has its army of adherents, and although they fight as an army should it is difficult to see for what they contend, and almost impossible to differentiate between their cause, telegony, and reversion. As far as one can see they appear to contend that as a result of conception the body of the mother takes on certain characteristics of the male parent; that through the foetus the mother becomes "saturated" with the blood and "nature" of the male parent, and that this change is systemic; that the whole body of the dam becomes saturated as opposed to what they assert takes place in telegony, viz., that the ovaries or immature germ cells only are involved. Some even contend that not only do systemic changes take place, which influence the future offspring, but that changes take place in the mother herself; not only that each succeeding offspring appears as a better copy of its male parent and that the system and constitution of the mother is changed, but that her appearance as the years go by approximates more and more to that of the male unit. That in the human race there are many married couples which grow more alike unto each other appears to be certain; that this approximation is due to saturation is open to question, and requires proof which as yet has still to be produced; in fact, instances can be found of couples which markedly resemble each other and which are childless. Is it not possible that this change is environmental? Is it not possible that two persons happily mated, living the same life, eating the same food, exercising the same tastes, engrossed in the same hobby, thinking in unison, and with everything in common, is it not possible that instead of two entities they become in very truth halves of one whole. It is a matter of daily observation, that persons of the same type and

appearance invariably have the same tastes and mode of life; may the converse not be possible? At any rate this is a possible explanation, with no more proof certainly than the saturation theory, but certainly with no less. As an offshoot of the theory under consideration, it is asserted by some that if a mare is mated with a jackass she becomes so saturated with the blood of the ass or, as it is often termed, its " nature " that not only is the progeny sterile, but that the mare if subsequently mated to a horse will also prove to be sterile. There is of course no warrant for this assertion. Not only the experience of breeders, but the results obtained during Cossar Ewart's experiments proved that mating with another species did not impair the subsequent fertility of the dam, and that there was no indication of the previous mating; in other words, that the dam was in no way impaired for breeding pure-bred stock.

PREPOTENCY.

The term prepotency expresses the power of a sire or dam to stamp its image on its offspring, type, colour, or may be a peculiarity or variation from the usual standard. A high degree of prepotency is oftenest found in breeds of ancient lineage, or amongst members of a strain which is very much inbred, which probably amounts to the same thing. There can be no doubt that the majority of wild animals are very much inbred, and in consequence have acquired a high degree of prepotency by fixing the character of a particular type or variety, and at the same time by the elimination of crossing, checking the tendency to revert to some remote ancestral form. Prepotency, however, is a purely relative term; for instance, a well-bred bull may be prepotent to the majority of the herd, but a certain cow, possibly more inbred, may throw a calf which proclaims the fact that in this case prepotence is carried by the other sex. Again, a bull which has not distinguished himself by stamping his image on calves from pure-bred cows of his own breed may and often does gain a well-merited reputation for prepotency when mated with half-bred or nondescript cows. In fact when a pure-bred bull of any breed is mated to a mixed herd of cows it is the exception if the bull does not show himself markedly prepotent, and many farmers are of opinion that it is the sire which is always prepotent. But a more likely explanation is that the male is of purer breed and also possibly inbred. Of course if two pure-breeds of equally ancient lineage are crossed neither sex or breed may show marked prepotency over the other. A blend of the different characters may take place, or, again, some character may be prepotent in the one sex and another in the opposite one. From the foregoing remarks it will be seen how very important it is to use only a pure-bred sire, The longer the breed has been established the more likely is the individual to reproduce the characters and points desired, for prepotence is not a question of the individual only; it is equally one of race, and this is also an explanation of the fact that an indifferent thoroughbred horse will invariably get better stock than a much better animal of no pedigree. Galton is of opinion that " high prepotency does not arise through normal variation, but must rank as a heritable sport of aberrant variation ". There is no doubt that a sport may be prepotent, or possibly, to speak more correctly, may be dominant, but dominance is not a sport, as we shall see later under " mendelism ", but a factor

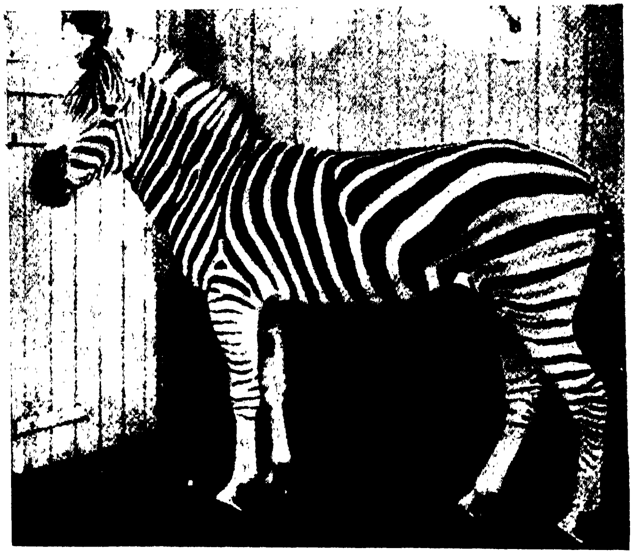


FIG. 1 "Matopo". A Burchell Zebra (Chapman variety). Sire of the hybrids "Romulus", "Brenda", and "Sir John". (After Professor Cossar Ewart.)

FIG. 2.—"Romulus". Hybrid by the Burchell zebra "Matopo", ex "Mulatto", with the breeder, Professor Cossar Ewart, of Edinburgh.

Heredity.

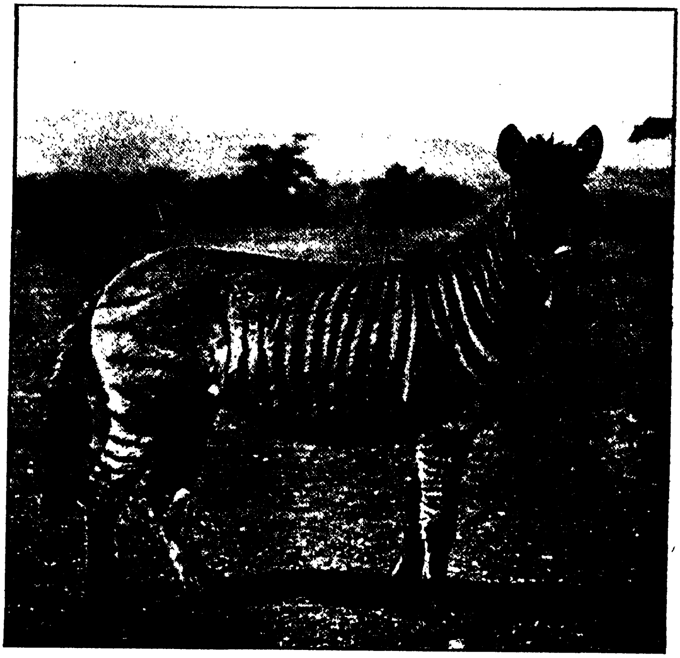


FIG. 1.—"Sir John", hybrid foal by "Matopo", *ex* "Tundra", a skewbald Iceland pony. (After Professor Cossar Ewart.)

FIG. 2. "Matopo", the Burchell Zebra Sire. "Romulus", hybrid offspring by "Matopo", *ex* "Mulatto", one of Lord Arthur Cecil's Island of Rum ponies—showing difference of face markings.

(After Professor Cossar Ewart.)

which enters into all and every genetic problem where two cells combine. Another belief which obtains very largely amongst stock breeders and farmers is that the shape, colour, and external characteristics are derived from the sire and that the internal organs, constitution, and temperament are received from the dam, but in the light of what has already been said this of course will not bear examination. More than forty years ago Darwin recognized that " the subject of prepotency is extremely intricate " ; it still remains so, although much that was then obscure is now revealed to us.

REVERSION.

The terms reversion and atavism have been used in a different sense by several biologists and experimenters. Karl Pearson, for instance, defines reversion as " the full reappearance in an individual of a character which is recorded to have occurred in a definite ancestor of the same race ", and atavism as " a return of an individual to a character not typical of the race at all, but found in allied races supposed to be related to the evolutionary ancestry of the given race ". Others again appear to have made use of the same terms in the converse way. In this paper, therefore, the terms will be regarded as synonymous, and agreeing more with Weissmann's definition: " By the term reversion is meant the appearance of characteristics which existed in the more remote ancestors, but were absent in the immediate ancestors, i.e. the parents ". In spite, however, of this definition, which appears to be unambiguous, the term has been used in a very loose manner, and made to include phenomena and results which are very misleading. In fact Bateson, in " Materials for the Study of Variation ", observes: " Around the term reversion a singular set of false ideas have gathered themselves. It would probably help the science of biology if the word ' reversion ' and the ideas it denotes were wholly dropped; at all events until variation has been studied much more fully than it has yet been ". But that reversion does occur there can be no manner of doubt. The dorsal stripe of dun horses, the bars or stripes in the vicinity of the knees and hocks, and similar phenomena may be taken as examples. Cultivated flowers again often revert to the original wild ancestor. The nectarine which was originally a sport from the peach—in fact is a smooth skinned peach—often reverts to the original peach or, at any rate, so resembles it that it is difficult for even an expert to point out the difference. But to suggest, for instance, that a hare lip in man is a reversion to some ancestral type is clearly a wrong interpretation, the explanation being that it is a clear case of arrested development due to the fact that at a certain period of foetal life the nostrils communicate with the outer corners of the mouth. Should this communication, which normally closes, persist, or become only partially obliterated, we have an abnormality which is perfectly normal in other species. Under this heading can also be included those ancient relics known as vestigial structures, for although they are not the result of the arrested development of an organ which would be normal at the present stage of our existence, their *occurrence* is still normal. They are *always* found; in fact it is only when their development is not arrested in the usual way that they become abnormal. Much experimentation in connection with the problem of reversion has taken place, but the different interpretations extracted from these results give one

pause, and force one to the conclusion that we are in practically the same position as before. As an illustration, Cossar Ewart crossed a tabby coloured Persian cat with a white male of the same breed, the result being two tabby and two white kittens. The two white kittens when mature, being male and female, were mated, and produced four kittens; two pure white like the sire and grandsire, and two tabby coloured like their grandmother. Ewart claims this as an instance of reversion, but Thomson, commenting on this experiment, remarks: "There appear to be many similar phenomena, and it seems in no way advantageous to apply the term 'reversion' to what is merely a reassertion of grandparental characters". Again, Cossar Ewart, in summing up the results of his Penicuik experiments, says: "I think it must be admitted the pigeon and rabbit experiments go a long way towards proving the fact of reversion, and the more I contemplate my zebra hybrids the more convinced I am that they are neither new creations, in the strict sense of the term, nor yet intermediate forms; and if they are neither one nor the other, they must be more or less accurate restorations of their comparatively remote ancestors". But the Dutch botanist, De Vries, draws a very sharp line between "true reversion" and what he calls "false atavism or vicinism", which is due to crossing; and concludes that true atavism or reversion caused by an innate latent tendency seems to be very rare. There can be no doubt that crossing does cause the expression of characters which may have lain dormant for generations. It may not be true reversion; it may be that these cases of so-called false reversion or vicinism are really normal Mendelian phenomena, which require further elucidation.

MENDELISM.

Just ten years ago the rediscovery of Mendel's epoch-marking treatise gave an enormous fillip to the study of genetics. Several biologists of repute were able to confirm Mendel's conclusions, and it was quickly recognized, as Professor Bateson says, that "the experiments which led to this advance of knowledge are worthy to rank with those that laid the foundation of the atomic theory of chemistry". Since the publication of Darwin's "Variation of Animals and Plants under Domestication" in 1868, very little had been done to further the elucidation of the great problem of heredity, a large majority of essayists and investigators being content to rearrange the same facts without adding anything fresh. There can be little doubt that had Mendel's great discovery (first published in 1865) come under Darwin's notice, many of the conclusions set forth by that master, in his work already referred to, would have been modified in many instances; and it can be but a matter for regret that such a mind missed the opportunity of working along a new line of thought, which in his case might have led to infinite possibilities. What then is Mendelism? What is this great law which put new life into a wilted branch of research? "Mendel states that, like other investigators, he had been struck by the regularity with which offspring of certain hybrids reproduce the pure ancestral forms. But owing, as he supposes, to the complex nature of the cases studied, and to want of accurate statistics, the precise facts had never been ascertained. Accordingly he set himself to work out some cases from which every confusing element should as far as possible be excluded." (Report 1 to Evolution Committee, 1902.) After a considerable number of preliminary experiments, he

decided that the ordinary edible garden pea was best suited to his purpose; for one thing, under ordinary conditions, it is self-fertilizing, the peculiar structure of the flower protecting it from cross-fertilization by insects. Other reasons which urged its suitability were found in the fact that in its several varieties characters differing markedly could be easily seen and distinguished. Some varieties are tall, others of dwarf habit; some varieties when ripe produce green seeds, others again a yellow seed; some have a wrinkled pea, others a smooth one, and so forth. Carrying this observation to its obvious conclusion, he crossed a tall variety with a dwarf, a wrinkled variety with a smooth, and so on. In the case of the first cross mentioned the seeds thus produced grew into plants which were always tall, and in the second case all the seeds produced were round and smooth. It was therefore found in the case of each pair of characters that in the first cross only one appears. Mendel called this a dominant character, and the other which disappears in the first generation he called *recessive*. To simplify matters we will take the case of the tall and dwarf character only. The seeds produced, as the result of the crossing of the tall and dwarf varieties, were planted and, as already stated, produced plants apparently differing in no respect from the original tall parent. The flowers of these were self-fertilized and produced seeds; this is the second generation. When grown up they proved to be mixed, some being tall, others of dwarf habit; in fact some were like the tall grandparent, others like the dwarf grandparent. But it was found that the talls ("dominants") numbered roughly 75 per cent. of the total number, whilst the dwarfs ("recessives") only numbered 25 per cent. It was also found that the plants were either tall or dwarf; there were none intermediate in height, neither did it make any difference which was the pollen-bearing parent; either cross gave an identical result. The following year enabled Mendel to make another important discovery. It was found that when the seeds of the dwarfs (the recessives) were sown, they produced nothing but dwarfs: in other words the recessives bred true to type and character, this also applying to each succeeding generation, for, although the recessives which appeared in the second generation are the result of a cross, in which "tallness" is the dominant factor, the succeeding generations for all time breed true to the recessive dwarf character. From this it will be seen that some desirable feature or point which it is desired to retain may disappear and appear to be lost in the first generation, reappearing again in the second, indelibly stamped there for ever as a permanent and ever recurring characteristic. This is a most important fact to remember. Many a one has desired to perpetuate some "variation" which has spontaneously appeared in his garden; seed has been saved, and after sowing, the result has been anxiously awaited, disappointment in many cases following, owing to the fact that the much desired feature was recessive in character, and was therefore suppressed in the first generation. But it is equally certain that it would have reappeared in the next, had the seed again been saved, and that the desired character would have been established. We must now turn to the dominants of the first generation and see how they behave. Mendel found, on allowing these to fertilize themselves, that all dominants are not pure as are the recessives. He found that, though *apparently* pure, they are not *actually* so as are the recessives; one-third only of the dominants bred

true to tallness, the other two-thirds produced seed from which sprang talls and dwarfs in the proportion 3: 1. The tall plants then of the second generation were of two kinds—those which were pure for tallness and those which carried the factor for both the tall and the dwarf. And it has been found that in subsequent generations the pure dominants and the pure recessives always breed true, and that the impure dominants throw dominants and recessives in the proportion 3: 1. The whole of the second generation then consists of three kinds of plants—pure dominants, impure dominants, and recessives in the proportion 1: 2: 1. So far all appears plane-sailing; unfortunately other elements enter of a more or less complicated nature, the majority of which it will be impossible to describe or discuss in this article. As an illustration, however, the case of the so-called Andalusian fowl may be cited. It is found that when a white fowl and a black fowl are mated that they occasionally produce a blue. This, however, is not an Andalusian as known to poultry fanciers, although this breed was in all probability produced in a similar manner. The Andalusian fowl is a black-laced bird, having a blue ground, whereas the blue resulting from a black and white first cross is a pale blue, lavender, or French grey without lacing. Various experimenters have found that when these blues or the so-called pure Andalusian are mated together the resultant offspring are whites, blues, and blacks, in the proportion 1 : 2 : 1 ; that is 25 per cent. white, 50 per cent. blue, and 25 per cent. black. Further, it has been found that the blacks when interbred breed true, as do the whites or splashed whites; again, a black mated with a white of this cross, or vice versa, always produces a blue, although the first and original cross which produced the original blue only very occasionally does so. The blues of this next generation, if mated together, again split up as before into the old formula of one white, two blue, and one black, and this goes on for generation after generation. Some seven years ago the writer started with the intention of establishing a blue breed of poultry, but has, for a time at least, abandoned it, as each succeeding year only confirmed the conclusions of other experimenters. Certain it is that the sixth and last generation were a better and more decided blue than the first generation, but equally certain is it that the proportions remained the same. There were no more blues than in the first filial generation. The blacks and whites mated together produced all blues, and the blues split up, as they did in the earlier generations, into the expected proportion of 25 per cent. white, 50 per cent. blue, and 25 per cent. black; so that it appears to be impossible to establish a blue breed on these lines. Therefore it will be seen that, although this is claimed to be a Mendelian phenomenon, in this instance colour does not conform to the usual Mendelian law of dominance. It may be as well to state that blue in this case can hardly claim to be a true colour; it is really a blend of black and white, or possibly, to speak more correctly, a dilute black, but why it does not breed true when once blended, as it does in the case of the mulatto, requires further experiment and elucidation. This again is another illustration of an instance which does not conform to Mendel's law; the child of a white and a black is a mulatto, and these intermarrying breed true. There is no splitting up of colour. As Thomson says: "It is a clear case of blended inheritance and of blended inheritance remaining stable. There is not the least hint of Mendelian inheritance." The same author quotes another instance where Border

Leicester rams mated with Cheviot ewes produce half-bred lambs, and these when mated with each other continue in successive generations to breed true to their own type with very little (if any) tendency toward either of the two parent breeds; and it will be possible to give many instances of this nature. At one time it almost appeared that the breeding of high-class stock would become more or less a question of formulae. That Mendelism will be of great assistance to us there cannot be the shadow of doubt, but that we shall be able to breed winners to order is to expect too much. In this connection Professor Bateson observes: "To avoid raising false expectations it should also be said that many of the small fancy points which distinguish individuals of the same breed from each other are rather of the nature of fluctuations than definite transmissible attributes. In the regulation of these finer details it is improbable that heredity plays any very prominent or at least assignable part." There is no doubt that this is so, for except in the making and establishing of new breeds it shall help the fancier or breeder little to know that rose comb is dominant to single comb, or that a polled head is dominant to a horned one. The details which play so prominent a part in the show ring or pen are of too fine a nature to be arrived at by so precise a method. If it could be found that the standard of perfection is dominant or recessive, then indeed would the worries of the fancier be at an end, but unfortunately such is not the case; in fact with the application of a little intelligence it is possible to breed quite as perfect specimens from average specimens of the same strain. As Professor Bateson further says: "A knowledge of genetic physiology will only help him (the breeder) here in so far as it may warn him not to pay extravagant prices for animals whose qualities are not genetic or transmissible". That the establishment of the law of dominance is a huge step forward admits of no doubt; that one is able to predict with certainty the difference in result of mating two pairs of mice, rabbits, or sweet peas externally similar in type, markings, etc., through knowing the difference in their genetic constituents, goes further and deeper into the heart of the problem than ever before. Of course having got so far only points the way to the ultimate goal, and directs us along the correct lines we must proceed, and there can be no doubt that the fundamental basis of the study of all the problems of heredity must be the germ-cell, the ovum, the egg itself. In 1866 Haekel said: "We may regard the nucleus of the cell as the principal organ of inheritance". What was then little more than a prophecy is now a well ascertained fact, and only further investigation into the nature and constituents of the fertilized ovum will elucidate the many problems of heredity and inheritance. Much work in this direction has, and is being done, by numerous investigators, more especially in England, America, and the Continent, but an account of it would be outside the scope of this article, which is already longer than originally intended. The fringe only of this huge subject has been touched, such branches as Darwin's Theory of Pangenesis, the Heredity of Disease, Determination and Heredity of Sex, Colour, Transmission of Acquired Characters, Weissmann's Theory of the Germ-plasm, and a hundred and one other aspects must be passed over. But to those who wish to go further than this sketch takes them, the appended short list of works bearing on the subject is recommended, and the writer takes this opportunity of acknowledging his indebtedness for the many

excerpts therefrom used in this article. The list referred to is as follows: " Mendelism ", R. C. Punnet; "Mendel's Principles of Heredity ", Professor Bateson; " Heredity ", Professor J. Arthur Thomson; " The Principles of Heredity ", G. Archdale Reid; " Materials for the Study of Variation ", Bateson; " Origin of Species ", Darwin; " Variation of Animals and Plants under Domestication ", Darwin, Reports I, II, III, and IV to the Evolution Committee of the Royal Society; " The Penicuik Experiments ", J. Cossar Ewart; " Experimental Contributions to the Study of Heredity " and " Cross-breeding in Animals " by the same author; " Darwinism ", A. R. Wallace, will also give food for thought and assist.

Types of the Merino.

SOME OF THE AUSTRALIAN BREEDS.

By J. J. McCALL, Government Wool Expert, Natal.

THE receipt of a letter from a progressive sheep farmer in Natal, who intends to build up a first-class merino flock, and who has bought of the best imported Australian sheep, has given me the idea that perhaps the information supplied to him privately may prove of interest to others similarly situated. The farmer in question has purchased what are known as "Zara", "Widgiewa", and "Wanganella" rams and ewes, and he asks me for advice so as to enable him to decide which type of sheep he should adopt.

Within the past month I saw a paragraph in one of the agricultural publications of South Africa wherein it was stated that a farmer in one of the neighbouring Provinces, whilst speaking at an association meeting of farmers, hazarded the startling item of information that a "Wanganella" was a grade Lincoln-Merino. I would have imagined that, after the numbers of "Wanganellas" that have been imported into South Africa within late years their breeding should be somewhat better known. In the following remarks I will endeavour, from my own knowledge and collated information, to show how the above-mentioned types have been evolved.

"Wanganella", originally the name of a station in New South Wales, has now a post office and township. The Wanganella stud was formed by Mr. Peppin in 1861. The original flock contained a large draft of South Australian merino ewes. (As is well known, the South Australian merino carries a robust type of wool, and is large framed.) Amongst the original sires were imported Rambouillet rams, one of which was called "*Emperor's Get*". From this commencement, Messrs. Peppin & Son evolved what, to-day, is now a fixed type of merino, viz., the "Wanganella". They followed the true stud master's maxim, "*Breed to suit the country*". This rule, accompanied by judicious culling and mating, will always command success. The fact is often overlooked by breeders that they usurped the place of nature when they took charge of animal mating and rearing. That law of Nature, "*the survival of the fittest*", is inexorable. The unfit die; those that can adapt themselves to changed environment, live. Man, by artificial selection in sheep breeding, stacked an additional 10 lb. of wool on a sheep's back within fifty years. That is an additional 300 per cent. compared with what the sheep of the early days carried. But has man increased the animal's vitality and constitution by half that amount? Certainly not. It is the artificial

surroundings that have perpetuated the strong and weak alike. Man must adopt Nature's method and cull out all the unfit before they have the opportunity of perpetuating their weaknesses. It is only in this way that breeds and types can be "fixed". To proceed with the history of the "Wanganella" sheep. From 1861 to 1878, Messrs. Peppin & Son owned and controlled the stud. In the latter year, Messrs. Austin & Millear purchased the station and the stud, and continued to breed along the same lines as their predecessors. In 1894 the partnership was dissolved, each partner taking half the sheep and continuing on the same lines of breeding.

Mr. Millear, sen., still used the name "Wanganella" for his estate, whilst another stud was formed at Deniliquin Park, where a ram called "Sir William" was bred and sold for over £1400 to another New South Wales Stud Company; also a ram called "Donald Dinnie", which was sold for £1260 to a South Australian Stud Company. The Austins are also continuing the same type. I had the pleasure of overhauling an "Austin Wanganella" ram which was imported by Mr. Jas. Morton, of Tweedie Hall, some two months ago, at a cost of over £500. He was an object lesson in "Wanganellas", large framed, good constitution, with length, colour, and density in the fleece—a typical animal of his breed.

In this connection it is interesting to note the blood relationship that exists in many of the various studs which, to-day, breed an acknowledged "type".

The ram mentioned above, viz., "Donald Dinnie", was the sire of the ram "Dinnie 58", which took championship honours at the late Adelaide Royal Agricultural Show in South Australia, and the comment of the judges was: "*True to the type which characterizes the leading South Australian studs*"; "*a big, plain-bodied sheep, well covered with excellent quality wool*". Here we have a "Wanganella" capturing honours from the robust South Australian sheep. The champion ewe was also of "Wanganella" descent, though bred in South Australia, and is described as "*a beautiful sheep, of great size, with splendid quality wool*".

Another well-known name in sheep circles in this country is "Zara". Now this place is near "Wanganella", but the type is totally different. They favour the Tasmanian type, in fact, they are all pure Tasmanian Gibson blood. Still another name is "Widgiewa", but the "old order changeth". Mr. Horsfall has sold "Widgiewa" to Messrs. Falkener & Sons, who have introduced another "Wanganella" strain in the Boonoke blood. That courageous stud master, Mr. Morrison, made "Widgiewa" sheep famous. He dared the unanimous opinion of the leading flock masters in Australia, and with the courage of his convictions introduced the dangerous Vermont cross into the "Widgiewa" stud. The success was so overwhelming that his daring was the subject of congratulation from his erstwhile critics. I am afraid "Widgiewas" of the old type are things of the past.

Before closing there is one other "type" which is becoming known in South Africa, the "Haddon Rig". This stud was founded in 1875 from "Wongamong" sheep; in 1879 "Wanganella" blood was introduced and has since been kept pure without further introduction of new blood.

"Wongamong" stud, the foundation of "Haddon Rig" stud, was founded in 1853, just sixty years after the first merino sheep were imported into Australia from the Cape of Good Hope. In 1863 ten "Wanganella" stud rams (bred from an imported Rambouillet ram) were introduced. Since then no other strain has been introduced—a period of close on fifty years.

In years gone by, "Wanganella" borrowed blood from South Australia; to-day South Australia is borrowing from "Wanganella".

All the foregoing is written to show that, notwithstanding the numerous and various types and names of merino sheep in Australia, they are all blood relations more or less distant. Judgment in culling and mating, a study of the effect of soil and climate, and application of the knowledge obtained, are the true reasons for the successes which have attended Australian sheep husbandry, and it can and will be repeated in the Union of South Africa.

Cotton Cultivation: Prospects in Transvaal.

By T. A. J. PLACE, Division of Tobacco and Cotton Industries (Transvaal).

MUCH has been said and written during the past few years relating to the expansion of the cotton growing industry in South Africa. Experts have devoted considerable time in the endeavour to induce farmers whose farms are situated in those parts of the country where favourable soil and climatic conditions exist to give the plant a fair trial, and their efforts in this direction, it may be said, have met with no small measure of success.

The number of progressive farmers settled on the land in the sub-continent is on the increase, and so long as they continue to increase and to extend their efforts the cotton industry is bound to expand. There are large tracts of country, not only in South Africa but also in Nyassaland and other parts, eminently suitable for cotton. It is also an established fact that a good quality cotton can be produced in many parts of South Africa.

Prizes for Transvaal grown cotton were presented by the Witwatersrand Agricultural Society at their annual show held in Johannesburg in April and May, 1910. Many growers competed; the samples were sent to England and were judged by the British Cotton Growing Association; the first prize being awarded to a farmer in the Zoutpansberg District. The report of the Manchester expert who judged the entries reads as follows:—

First: No. 6, good colour, bright and lustrous, staple $1\frac{3}{16}$ inch, very excellent result. (Winner of cup.) The report speaks for itself. When it is understood that the samples, all of which were favourably commented upon by experts in the centre of the cotton manufactories of the world, were produced by farmers to whom the cotton plant was, and still is, a new departure, it is hardly exaggerating to state that the development of the industry is already assured.

GOVERNMENT EXPERIMENTS.

A few striking results obtained with cotton during the past season on some of the Government Experimental Stations portend prospects so brilliant as to convert even the most confirmed pessimist. It is customary on large cotton plantations and on experiment stations in the United States of America to make yield tests of the various varieties at the end of the season. In a recent bulletin issued by the United States Department of Agriculture we find an account of such a test, the result of which reads 48 bolls of seed-cotton to the lb. Compare this with a yield test made with one of the varieties (Bancroft) of last season's crop at our Rustenburg Experiment Station, reading 43 bolls to the lb. We have no cause to be disheartened even at this early stage, especially when it is remembered that until this season no systematic experiments had ever been conducted in the Rustenburg District. The results of our experimental work at Rustenburg may be taken as proof that the cotton belts of the Transvaal extend even beyond the borders of the low veld. This means that our source of supply will in time prove almost unlimited and will surpass our own

estimates, made only a few years since, when the general impression was held that cotton growing would be confined entirely to the low veld.

At the Barberton Experiment Station also our results have proved highly satisfactory. Some of the results of our experimental plots are as follows:—Yield of seed cotton per acre, "Doughty Big Boll" 1292 lb., "Black Rattler" 1272 lb., "Cooks Long Staple" 1224 lb. In the cotton belts of America 1000 lb. per acre is considered a good crop.

At the Tzaneen Experiment Station in the Zoutpansberg District the results have been equally satisfactory. Twenty different varieties were grown experimentally, seed being selected for distribution to grower's from the best developed plants of each variety.

Next season it is proposed to produce a commercial crop of cotton of about 500 acres at this station.

VALUE OF COTTON CROP.

Regarding the value of the cotton crop, I would quote the following extract from an article by W. H. Scherffius, M.S., Chief of the Tobacco and Cotton Division:—

Cost of production and net profits.

The cost per acre should be approximately:—

	£	s.	d.
Preparing and breaking	£0	7	0
Harrowing	0	2	0
Planting	0	1	0
Cultivating	0	5	0
Harrowing and hand hoeing	0	7	0
Picking 1000 lb.	0	10	0
Cartage to gin	0	1	0
Wear and tear of implements	0	1	0
Sundries	0	3	0
	£1	17	0

	£	s.	d.
One acre should produce 1000 lb. seed cotton with at least 30 per cent. of lint, i.e. 300 lb. @ 5d. per lb. ...	£6	5	0
Total cost of production per acre	1	17	0
Profit per acre	£4	8	0

At the present moment the price of cotton is advancing.

American uplands are fetching on the English market the phenomenal price of about 7d. per lb. I may add incidentally that we have received reports on South African cotton stating that it is worth about 1d. per lb. more than American upland cotton. Taking these figures as a basis of calculation, we have

	£	s.	d.
300 lb. lint @ 8d. per lb.	£10	0	0
Cost of production	1	17	0
Showing a profit per acre of ...	£8	3	0

"While it is not to be expected that this attractive price will be maintained, it is safe to predict that a commodity like cotton, which is one of the necessities of life, will always command a fair price."

The cost of shipping cotton to England would be a fraction under 2d. per lb., including primage, wharfage, railage, etc., must of course be deducted from the profits shown above. The figures represent the approximate cost of production to the grower in the United States of America, and it is estimated that the cost to the Transvaal grower would be slightly higher. A farmer in the Zoutpansberg District, who has grown cotton for some years, estimates that it cost him 40s. per acre to produce his 1909-10 crop.

Samples of South African cotton (season 1909-10) will shortly be on permanent exhibition at the Imperial Institute, South Kensington, London.

So much for the possibilities of South Africa as regards the production of cotton. We are convinced that a crop can be produced, the staple comparing favourably with that of other larger cotton producing countries. Now comes the question, "Can the crop be made a commercial success?"

I have often heard it remarked that experts in their enthusiasm lose sight of the commercial side of the question, and leave the farmer stranded to fight his own battles in respect to the all important matter of disposing of his crop at a profit.

To one who is not a practical farmer, merchant, or spinner, but who has received a commercial training in a vast metropolis, the most important point seems to be at what price per lb. can the crop be grown to yield a profitable return to the grower.

The point is this: No crop is a valuable one until the grower is sure of a good and ready market and a reasonable profit in return for the capital and labour expended.

I think it can be safely asserted that the demand for no other article is so far in excess of the supply as is the case with cotton, and having regard to this enormous demand it seems only reasonable to assume that, provided the crop is raised in sufficiently large quantities, a great industry will be built up in South Africa in time to come.

Inquiries are being made regarding the railway rates on cotton from stations in the Transvaal to the coast, wharf dues, and freight charges to England, brokerage, sellers' commissions, and so forth, and when this information has been collected it will be possible to arrive at something definite as to the net profit that can be reasonably expected by the growers in this country.

There is, of course, one point—an important one—that must not be lost sight of; it is this: The grower in the United States of America has an established market for his product. I refer not only to the English market which continuously cries for a larger output, but also to the home market in America. Briefly, it amounts to this: The American grower obtains, say, 6d. per lb. for that portion of his crop disposed of in his own country to which practically no freight charges need be added, while, owing to the shorter distances between the States and England and the greater shipping facilities, he possesses a further advantage over the South African grower in the case of that portion of his crop which is exported. We will assume he receives in Manchester 7d. per lb. for his cotton and allowing 6d. on the American market, this would mean that the mean average is 6½d. per lb. for the whole crop, whereas the South African grower, not possessing the advantages of a home market, must export the whole of his crop, and, therefore, assuming he realizes the same price

in England, i.e. 7d. per lb., the extra freight rates must be taken into consideration, plus the disadvantage of having no home market, from which a larger profit could naturally be derived.

But the South African grower must not be discouraged purely on account of the fact that the older hand at the game in America is in a position to go one better than the beginner, for, judging from the valuation of the samples in Manchester, South African grown cotton may command a higher price than American upland varieties. If it realizes, say, 1d. per lb. more, this will go a long way towards meeting the extra cost of shipping.

A COTTON HARVESTER.

The picking of cotton is a difficulty to be faced in South Africa, firstly because in certain districts there is a shortage of native labour, and secondly because what labour is available is not educated up to the standard of American labour which is employed in cotton picking at a fixed rate.

What is sorely needed is a suitable implement to perform this work, and, I believe, one or two inventors have taken the matter in hand in the past, but their attempts have not proved very successful. However, it would seem that a great stride has recently been made in this direction in the United States of America by Mr. Crawford Elliot, the inventor of the book typewriter. The cutting given below from the *Hopkinsville Kentuckian* of 28th July, 1910, speaks for itself. The enormous influence which will be brought to bear on the cotton growing industry by this invention cannot yet be fully realized. The fact that a commercial firm of implement makers has purchased the invention speaks volumes for the practical value of the new machine.

Here is the cutting: "Washington, 24th July. Patents were issued to-day to Crawford Elliot, the inventor of the book typewriter, on a cotton picker or harvester which he has perfected as the result of nearly seven years' constant effort. The basic patent granted covers forty different claims. The machine has been tested for two years in the cotton fields, and with it one man and a team of mules will do the work of forty hand pickers. Only the ripe cotton is picked, and this is done without injury to the green cotton or the flowers. The successful cotton picker has at last arrived and will enable the planters to greatly increase the present acreage under cultivation.

"The principle of the machine is a double row of bristle brushes about one and a half inches in diameter and fourteen inches long, spinning rapidly in such a manner that the revolving brushes are introduced into the plants close to the ground and drawn up in a vertical line through the plants, the brushes penetrating the bushes from both sides of the row. The ripe cotton adheres to the brushes, while the rest of the plant is not in any way affected, the brushes travelling to a receptacle where they are stripped of the cotton, and the operation is repeated.

"It has been thoroughly tested and demonstrated that it will do the work at a quarter of the cost of hand labour, which means the saving of 150,000,000 dollars a year to the cotton growers.

"The invention, which has been purchased by the National Cotton Harvester Company, of Chicago, means much to the growth and

expansion of the cotton industry, and it will undoubtedly add immensely to the annual wealth of the cotton growing States."

THE GINNING OF COTTON.

The ginning of his cotton crop is another matter of vital importance to the grower. On the Government Estate, Tzaneen, there are at present several gins, the property of the late Zoutpansberg Cotton Syndicate. The Government is negotiating for the purchase of the gins with the object of establishing one gin in each cotton growing centre. It is the intention of the Government to take over the raw cotton from the growers to gin and bale it. and afterwards to dispose of it to the best advantage, a charge of 1d. per lb. on the lint being made to cover the cost of labour and packing material. The 1909-10 crop has been disposed of to a Durban firm at 7½d. for first grade and 6½d. for second grade lint.

At this early stage it would not be possible for each grower to do his own ginning, and even when the industry is flourishing this course is not to be recommended on account of the necessarily heavy expense it would entail. It is thought, however, that at some future date, when they are in a position to do so, the growers should co-operate and conduct their own ginning operations in the various centres without any assistance from Government.

The centralization of ginning operations will also be the means of profitably disposing of the by-product, i.e. cotton seed. It has been ascertained that the firms of chemical manufacturers and soap makers are not able to quote for small quantities, so that the farmer would stand little chance of making money out of his cotton seed, except through the medium of a central depot for ginning.

NEW RAILWAY CONSTRUCTION.

The Zoutpansberg is the largest district in the Transvaal, and the Government is fully alive to the great and varied possibilities of this vast territory, as may be gathered from the fact that about 360 miles of new railway construction is proposed. By the courtesy of the General Manager and the Chief Engineer of the South African Railways, a map showing approximately the routes to be taken by the new railways is published with this article. The Komatipoort to Newington line has been opened to traffic for some time past, and the survey from Newington to Messina is rapidly proceeding, while from Pietersburg to Bandolier Kop the new line is already completed. That portion of the route from Komatipoort to Messina north of Newington must be taken as quite approximate, as the final survey has not yet been carried out.

There is little doubt that in time this line will be continued through to effect a junction with the main line from the Cape to Bulawayo; also that eventually the line from Pietersburg to Bandolier Kop will be connected up with the proposed line from Komatipoort to Messina. The new line will serve what will probably prove the largest cotton belt in the Transvaal, and the effect on the opening up of such a district is incalculable. The railway mileage to the coast will be reduced by something like 200 miles, to say nothing of the saving of the present road transport to Pietersburg, the present cost of which is at the rate of about 2s. to 2s. 6d. per 100 lb. per 100 miles, and as the distances in most cases are from 100 to 200 and even 300

miles it is easy to realize that the cotton growing industry will not be the only industry to benefit, for there are large areas capable of producing the finest citrus fruits and other tropical and sub-tropical crops, such as tobacco (of which a large quantity is already grown), maize, sugar, and possibly tea and coffee.

THE NEED OF COTTON MILLS AND FACTORIES IN SOUTH AFRICA.

Consider for a moment the quantity of cotton goods imported annually into South Africa, and what it would mean to the country if these necessities of life were made here.

As already pointed out in this article the American grower possesses an advantage over the South African producer in that he has a home as well as a foreign market for his crops. No doubt it would be deemed pure surmise even by those who are deeply interested in the development of the country to speak as yet of the feasibility of establishing cotton mills in South Africa, and it must be admitted that it would be somewhat premature to discuss details of such a possibility until we are producing something like a quarter of a million bales of cotton per annum. Be that as it may, however, there is no reason why we should not briefly review a situation which may not eventuate for a century, and yet may come to pass in a comparatively short time. Who would have had the temerity twenty years ago to predict that the mining camp of wooden huts and tents known as Johannesburg would develop with such rapidity that in 1910 we find it transformed into the largest and most flourishing town in the sub-continent and of world-wide fame.

The effect is wonderful, but we have not far to look for the cause of this rapid evolution. Gold was discovered in sufficient quantities to pay handsomely for the labour employed in working the mines. No power on earth could stay the advance of the mining industry from the time the first discovery of gold was made, and so surely as it is found that cotton can be grown in South Africa as a paying proposition, nothing will stay the progress of the industry. There exists an abundant supply of coal in the country for our factories, and eventually we shall have our own mills working and a home market created.

SHORTAGE OF RAW MATERIAL.

The value of gold, silver, precious stones, and minerals is ever fluctuating. Why? Because it is possible for the supply to exceed the demand. The price of cotton also fluctuates; not from the same cause, but because sometimes a corner is made or a poor crop is harvested. *The supply of cotton has never yet anything like equalled the demand,* and there is every indication that the present shortage will continue, and will rapidly become more serious rather than diminish unless new cotton fields are discovered at an early date. The large cotton houses in Manchester are just now at their wits' ends to know where to look to augment the supply of raw cotton for feeding the fifty million spindles in Great Britain alone.

The true state of affairs is ably commented upon in the following article which appeared in the *Rand Daily Mail* of 7th September, 1910, under the title " Cotton Growing in the Colonies ", which reads as follows:—" Mr. Howard Reed's paper before the British Association, to which allusion is made in to-day's cables, once more brings before the public of the Empire a very important problem. The cotton industry is one of the most valuable in England The spinning

mills alone are estimated to be worth eighty millions sterling, and they absorb some three and a half million bales of cotton every year. With the exception of half a million bales, the whole of this supply is drawn from America. Now the cotton industry in Lancashire, it is calculated, supports, directly or indirectly, ten millions of people. Therefore, we have the position that a considerable proportion of the entire population of the British Isles lives upon an industry which could not go on without raw material sent from a foreign country. What this means was seen during the civil war in America. Since then the industry has grown enormously, and a similar stoppage of supplies to-day would have a terrible effect. But experts agree that it is probable that the American supply will decrease. The late Sir Alfred Jones, the founder of the British Cotton Growing Association, pointed out a year or two ago that in the United States there was a tendency to consume more and more of the cotton grown in the country, for the number of spindles is increasing rapidly. But apart from this, every attempt to 'corner' the cotton crop in the States influences the trade upon which a huge population in England depends. Indian cotton is used largely in the East, and there does not appear to be much prospect of the supply becoming sufficiently large to help Lancashire to a much greater extent than at present, nor is there much likelihood of any of the countries now producing cotton on a considerable scale being able to expand their crop as to leave England less dependent upon America. Mr. Howard Reed, indeed, finds the prospects for the future dismal, and sees no chance of relief coming either from India or Egypt.

"Sir Alfred Jones declared that 'the only cure for the calamity which threatens the cotton trade of Lancashire is to broaden the basis of supply'. It was with this object in view that he founded the Cotton Growing Association, which has done useful work. It has stimulated the production of cotton in West Africa, Central Africa, the West Indies, South Africa, and other parts of the Empire. Many of the samples sent to England have been exceedingly good. But the out-turn of the new fields has been but a drop in the ocean of demand. Lancashire needs bales almost by the million, not by tens or hundreds. In time the Cotton Growing Association may be able to develop a supply from within the Empire. But the effort, if continued only on the present scale, must take many years, and in the interval the Lancashire industry is at the mercy of the climate and the speculators of America. Mr. Howard Reed's hint of the formation of a chartered company with a capital of five million to develop the cotton growing countries of the Empire is therefore very interesting, and one hopes something may come of it. It is a matter which the Government of Great Britain and, indeed, the different Administrations in the overseas Dominions capable of growing cotton might well take up. It is hardly an exaggeration to say that the prosperity of England depends upon Lancashire, and on the other hand the building up of an export trade in cotton would immensely benefit several parts of the British Empire, notably South and West Africa. Several territories within the Union produce splendid samples of cotton, and the fact that it is found growing wild indicates the suitable character of the soil. It is obviously desirable that in a matter of this kind the Empire should be more self-supporting, and that one of the most important industries in it should not continue to be at the mercy of the foreign suppliers of raw material."

Cotton Cultivation—Prospects in the Transvaal.

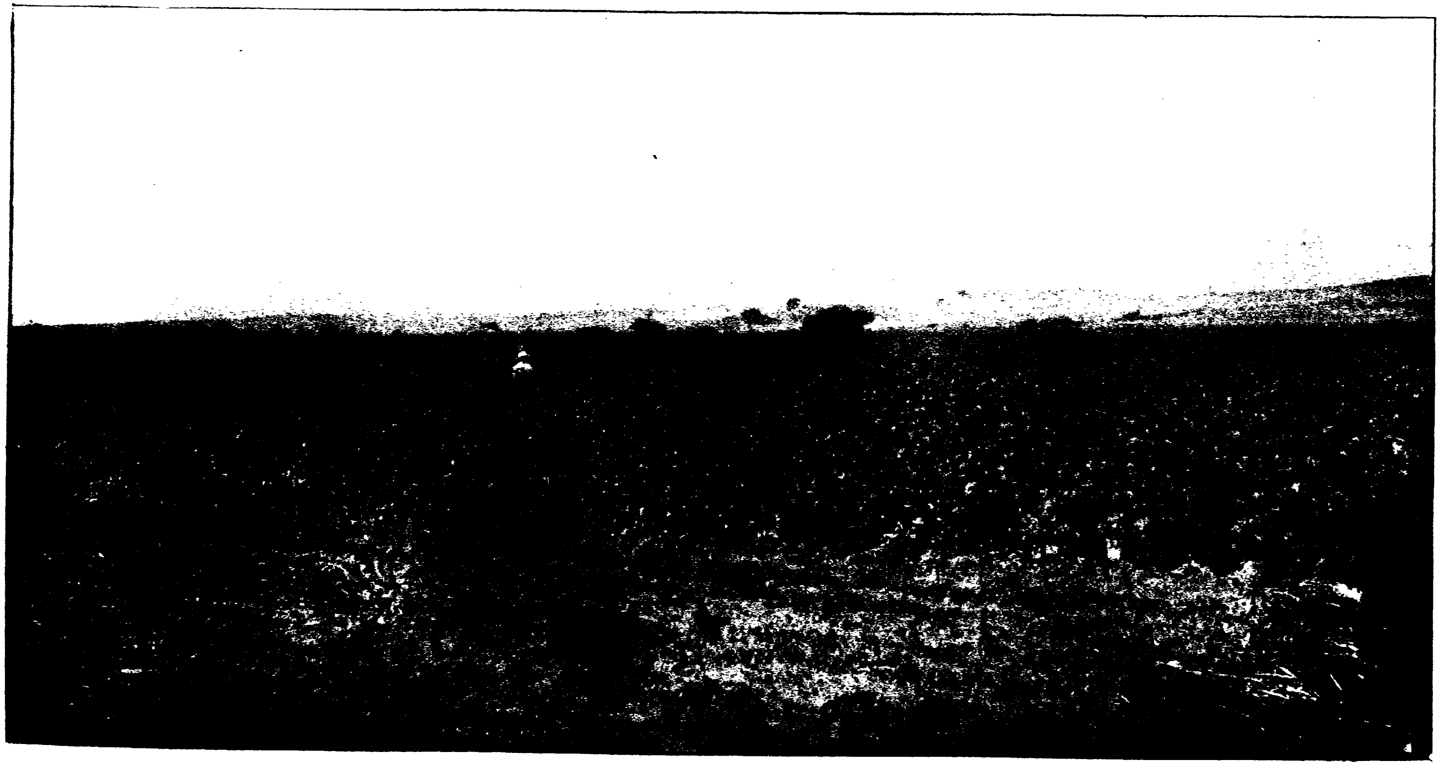
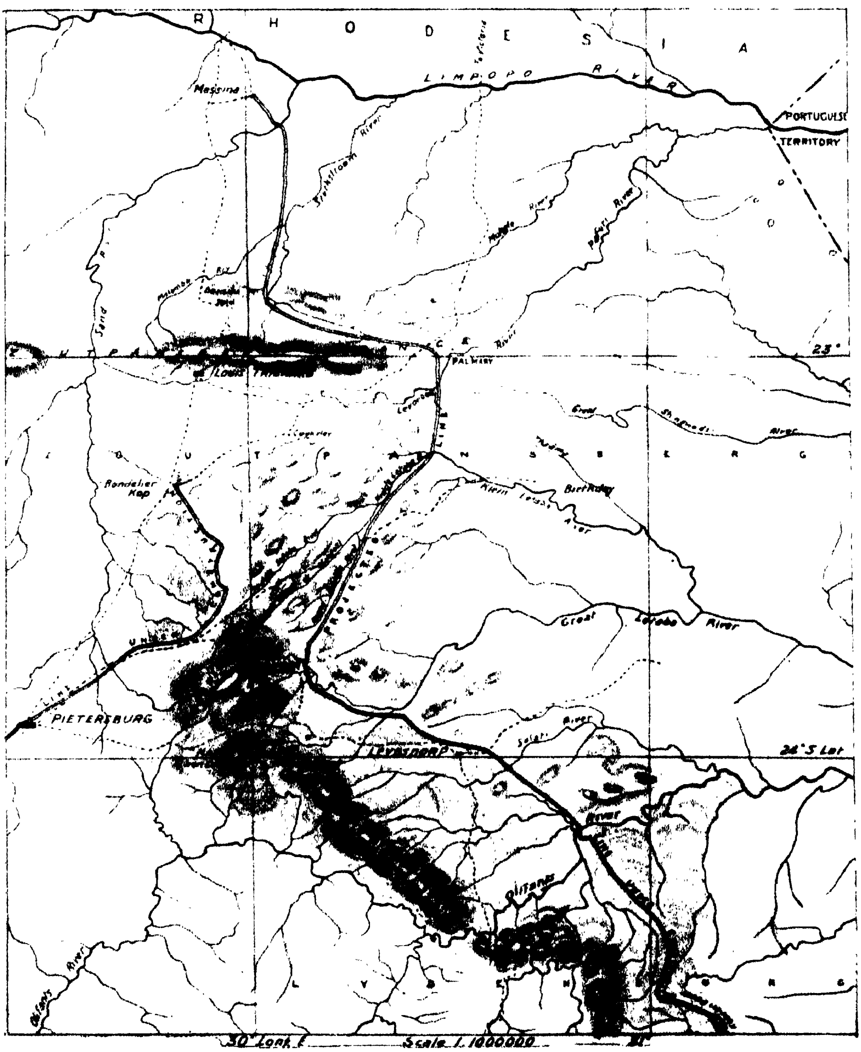


Photo by V. C. Brewer.

Field of Cotton, season 1909–10, Government Experiment Station, Barberton.

Cotton Cultivation—Prospects in the Transvaal.



Approximate distances :—
Pietersburg – Bandolier Kop, 70 miles.
Newington – Komatipoort, 360 miles.

Map of Eastern portion of Zoutpansberg District, showing Selati Railway and proposed extension.

Cream-Winning.

By ROBERT PAPE, Superintendent of Dairying (Transvaal).

MILK as it is drawn from the cow contains a comparatively small amount of fat, in general about 3 lb. to 4 lb. of butter fat to 100 lb. of milk. Rightly or wrongly, fat is usually considered the most valuable component of the milk, and, as a consequence, man very soon tried to obtain from it a liquid containing more fat and less water. For centuries it was simply left to time; the milk was left quiet till a layer of cream had formed, and this layer was skimmed off. This method, though very simple, had serious faults. It was not possible to obtain all the fat, for, however long the milk was left, an appreciable part of the fat remained in the skim milk. The skim milk began to turn sour very soon and, in doing so, lost its value for various purposes. The process wasted a good deal of time, and during all that time the cream was exposed to atmospheric influences and the danger of contamination by harmful bacteria. No wonder that mechanical engineers began to look for an apparatus which would separate milk and cream in a short space of time and, at the same time, recover a greater portion of the milk fat.

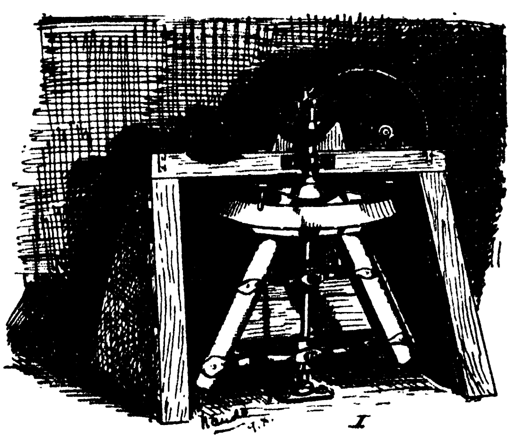


Plate I. Type 18

The first apparatus to separate cream and milk appeared in 1875 (see plate I). This apparatus was still very defective in itself, yet it was a large stride forward on the road of progress. Since that time the separators have been improved repeatedly and, at the same time, the number of types and patents multiplied. In 1908, already more than two hundred cream separators were known, and as this increase is still continuing steadily, their number will soon exceed three hundred. I will try to sketch in outlines the advantages of obtaining the cream by mechanical means.

Milk fat has a lower specific gravity than water, therefore the fat will try to rise to the surface, but in its upward direction it meets the resistance of those parts of the milk which it has to pass through. The rapidity with which the fat rises in milk can be calculated from a formula from Prof. Fleischmann:—

X = Rising of the fat globules owing to gravity;
a = Resistance to movement;
d = Specific gravity milk-serum;
d^1 = Specific gravity milk-fat;
g = Velocity increase of gravity;

then—

$$X = a \times g \left(\frac{d}{d^1} - 1\right).$$

For the action of the separator another formula can be used, and then the following values enter into the calculation:—

U = Velocity (number of times the fat globule describes a circle in one minute);
r = Radius of the circle the fat globule describes (half the diameter of separator bowl);
Y = Velocity of fat globules by gravity;

then—

$$Y = a \left(\frac{d}{d^1} - 1\right) \times \left(\frac{2\pi}{60}\right)^2 \times r \times U^2.$$

assuming that the separator bowl makes 6000 revolutions per minute, that the diameter of the bowl is 30 cm., and, for the sake of facility, leaving out the resistance to movement, then the calculation of the formula gives:—

X = 1·11 metres.
Y = 6700 metres.

Then the action of the separator is 6000 times as powerful as the action of gravity. The result is that the separator will take from the milk all the fat and more than would rise to the surface if the milk stood for hours or for days. Further, the separation in cream and skim milk takes place in a very short time, and the skim milk obtained will be of a better quality.

For butter-making the separator is, therefore, a very important instrument. The principal part of a separator is the bowl, and plates II and III show that it has been modified considerably by various makers in course of time. All these are more or less obsolete patterns, but they suffice for showing the existing differences. In the older types of separators the bowl is an open space, but this system has by now practically been abandoned, and, in most cases, the disks are being used (see plate III, fig 2).

I am not going to give an opinion as to which is the best shape for the bowl of a separator; every moment this is being modified, and each firm claims that its particular shape is the best. A separator bowl should be made out of the very best material, and the inside must be so that no harm can be done to the milk that flows through it.

From the formula it is evident that there is a fixed proportion between the number of revolutions and diameter of the bowl. The larger the diameter of the bowl the smaller the number of revolutions required, and the smaller the diameter the larger the number of

revolutions. The bowl shown on plate II, fig. 1, has a large diameter, and the number of revolutions comparatively small.

At present there are still some types of separators in use where the bowl has a small diameter, and the number of revolutions is consequently very high. Practice, however, is deciding against both

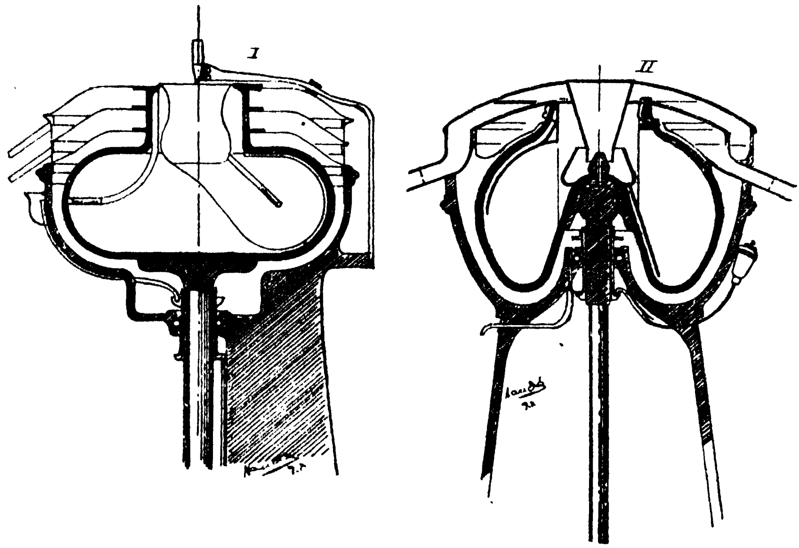


Plate II. Type 1881. Type 1883.

extremes, and there is a decided tendency to obtain a separator bowl of moderate dimensions, not requiring too high a number of revolutions.

An important detail of the separator bowl is formed by the disks. The patent was introduced by the Alfa Laval Company, and the

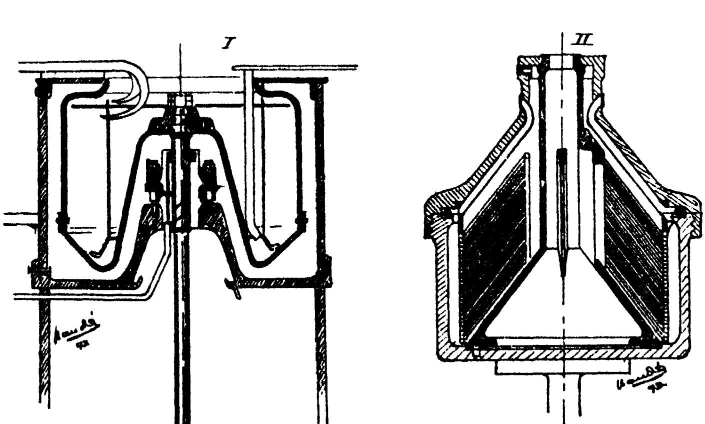


Plate III. Type 1889. Type 1899.

moment the patent had lapsed, separators with disks were being offered from every side. These disks influence the resistance to movement, and consequently the effect of the separator. In general, the

disks are applied in two different ways. First, like in the Alfa Laval patent, the horizontal disk. Later, the disk is applied in a vertical position; this is not very general, and I must say that, so far, I have failed to discover why the vertical position should be preferred to the horizontal.

The disks have the advantage of a sharper creaming, and the disadvantage that the cleaning becomes a little more troublesome. The makers look for a means to simplify the cleaning. One firm is offering for sale a specially constructed rod on which the disks are strung in such a way that they are not displaced during cleaning (plate IV, figs. 1 and 2). The vertical disks are usually hinged, and during cleaning they can be turned over like the leaves of a book (plate IV, fig. 3).

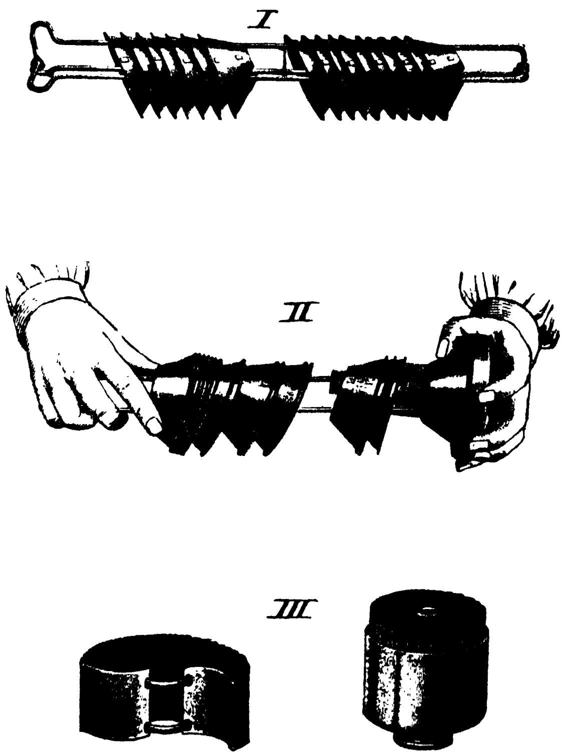


Plate IV. Disks.

The greatest variety is to be found in the regulation of the milk flow, the cream and skim milk tubes, and the gearing. It will take too much space to attempt a description of all these details, but minute directions can be found in the pamphlets published by the various separator firms.

Assuming that the separator has been put together correctly, the action mainly depends on the following causes:—

1. Shape and arrangement of the separator bowl, i.e. whether suitable disks are provided, whether the bowl runs quietly or vibrates, etc.

2. The centrifugal force, in other words, velocity of the bowl (number of revolutions per minute). The centrifugal force increases with the square of the number of revolutions.

3. The time the centrifugal force can act on the milk, or, expressed differently, the quantity of milk running through the bowl in a given time.

4. The temperature at which separating takes place. The higher the temperature of the milk the easier the cream and skim milk will separate and the less fat left in the latter.

5. The composition of the milk to be separated, i.e. size of the fat globules, "sluggishness" of the milk, acidity, etc.

If fairly sour milk is being separated, then the suspended casein will soon clog the bowl and put the separator out of use. All these five points are, to a greater or lesser extent, under the control of the operator during separating.

1. Shape and arrangement of bowl cannot be altered, but care can be taken that it runs quietly without vibration. If there is vibration it means that either the separator is not placed perfectly level or that it has been incorrectly put together.

2. On the handle of the separator appears an inscription giving the number of revolutions the driving wheel should make per minute. If this is carefully observed, the bowl will also make the prescribed number of revolutions. If the driving wheel makes 60 revolutions per minute and the bowl 6000, then each difference of one turn for the driving wheel makes a difference of 100 turns for the bowl. Say the wheel makes only 55 turns, then the bowl will make 5500. An excess of the prescribed number of turns is undesirable. Even with the best separators the work is heavy, and if a few extra turns are given each minute there is a needless increase in work which is not compensated for by the extra fat recovered from the skim milk. In general the number of turns for the driving wheel varies from 40 to 75 per minute, but a number of turns over 60 is rather high, especially if separating is lasting some time.

In starting to turn the handle one should always do so slowly and steadily, and increase the speed gradually. Jerks and force simply make the work harder, may damage the instrument, and do not result in a similar increase in speed of the bowl. You start the separator without milk, and only when the bowl makes the prescribed number of revolutions the milk is admitted.

I am limiting myself here specially to hand separators—the power separators, belt-driven or otherwise, in use in large creameries have no handles.

3. The quantity of milk running through the bowl in a given time can easily be regulated by means of the feeding tap. As a rule no more milk should run through the bowl than the stated capacity. The milk could be run through more quickly, and this would reduce the time spent on separating, but would result in a loss, as more fat would be left in the skim milk. In practice it is very difficult to run through exactly the prescribed quantity, and therefore it is advisable to manipulate the feeding tap in such a manner that a little less runs through.

4. The best plan is to separate the milk straight from the cow. Then it will have a temperature of 80° F., or slightly higher, and it will be easy to recover the fat. At the same time the milk contains

little acid and separating can progress smartly. If for some reason or other separating has to be delayed and the milk cooled down considerably in the meantime, then it may be advisable to re-heat the milk before separating. If the milk is still perfectly sweet, it may be heated up to 80° F., but in proportion to the milk being less sweet the temperature should be reduced. Milk on the point of turning sour should not be heated at all, for heating might turn it, and sour milk is no more suitable for separation.

5. Composition of the milk to be separated. This may be influenced in as far as the arrangement can be made to separate directly after milking, or in cases where large quantities of milk are drawn to start separating during milking.

As the parts of the separator move with such a tremendous speed, great care should be taken in oiling, and the lubricators provided should be kept filled with oil. Only the best quality of oil should be used, for certain oils thicken and clog the machinery they are supposed to lubricate.

The bulk of the dirt in the milk will be retained in the separator bowl, accumulates there, and, in the long run, it will impede the action of the separator. All milk should be poured through a good strainer or fine towel before separating, and it is not practical to rely on the cleansing effect of the separator bowl. Special separators have been constructed for the cleaning of milk, but these are not used at the same time for recovering the fat (see plate V, fig. 1). In addition to the dirt, the bowl will retain the so-called separator slime. This is composed of protein suspended in the milk and consolidated by the centrifugal force. The fresher the milk the smaller the contents in this slime will be. In sour milk a good deal of suspended protein is found.

When the bowl is clogged with dirt or slime or both, separating should be stopped, the separator should be taken to pieces, thoroughly cleaned, and put together again, after which the process can be resumed. When all the milk has run through, the bowl will contain skim milk and cream. This cream can be recovered by running a quantity of skim milk a second time through the separator. Finally, the bowl will contain skim milk only.

Directly after separating, the separator should be cleaned very carefully. A good plan is to continue turning for a few minutes whilst pure cold water is running through. Then the instrument is taken to pieces and each part washed carefully in pure cold water and all dirt removed with a brush. Then the parts are brushed and scrubbed in hot water and finally immersed in boiling water. After taking the parts from the water, they are carefully wiped dry with a towel. It is a mistake to treat the separator parts at once with hot water, for this makes the milk " cake ", and it is very difficult to remove this cake. Soda can be used in the hot water if great care is taken to rinse the parts so that no trace of it remains.

The frame of the separator and the floor round it are cleaned carefully too. Nowhere a speck of dirt or a drop of milk should be allowed to remain. Milk-drops which remain or are absorbed by the floor dry out, decompose, and vitiate the air, which has a bad influence on the quality of the cream. You can never be too careful and painstaking in cleaning a separator.

About the taking apart and putting together of the various separators, the pamphlets of the various firms give full details. This differs so much that I cannot summarize it all in one pamphlet.

At present the best separators leave not more than 0.10 per cent. to 0.20 per cent. fat in the skim milk, that is, on 100 lb. of milk (about 10 gallons), $1\frac{1}{2}$ oz. to 3 oz. of milk fat. But not all separators cream as sharply, and I know types leaving 3 oz. to 6 oz. of butter fat in the 100 lb. of skim milk. This makes a considerable difference in the course of a year. Say that during 200 days you draw 30 gallons of milk daily, making, for the year, 6000 gallons, or over 60,000 lb. milk. The best separator will leave from this amount 60 lb. to 120 lb. of butter fat, a less good one 120 lb. to 240 lb.

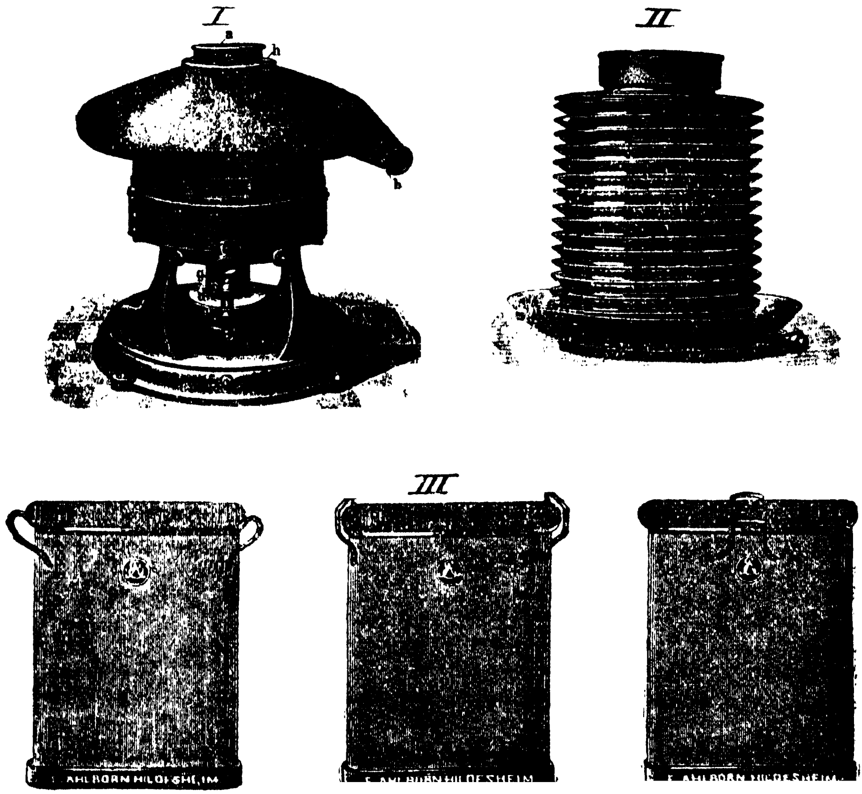


Plate V.

I.—Separator for Cleaning Milk. II.—Milk-cooler. III.—Swarz Vat.

Let us take the average figures and assume that the choice is between two separators. One is offered at £10, and leaves 90 lb. of butter fat in that milk; the other is offered at £5 and leaves 180 lb. of butter fat. This makes a difference of 90 lb. of butter fat, equal to 100 lb. of butter at 1s. = £5. Now it is probable that the dearer separator is made out of better material, and will last longer than the cheaper article. According to this example the difference in price would be wiped out in one year. The calculation is not quite correct if the skim milk is fed to pigs, for the fat lost in this milk will

benefit the pigs. But milk fat has a far higher value for butter-making than for pigs' food. It is therefore advisable to buy a good separator—if possible "the best", even if it is more expensive. In buying a separator you should not only ask the price, but inquire after the quality of the material and the average quantity of milk fat left in the skim milk when the separator is in ordinary use on a farm.

So far I have only considered cream-gathering with a view to butter-making and feeding the skim milk to pigs and poultry. But there is another side to the problem; the skim milk left after cream-raising may be put to a more remunerative purpose, viz., cheese-making. Cheese made out of partially skimmed milk I have seen in considerable quantities in South Africa. If there were no market for it, this cheese would not be imported, and if this cheese is imported there is no reason why South Africans themselves should not make it.

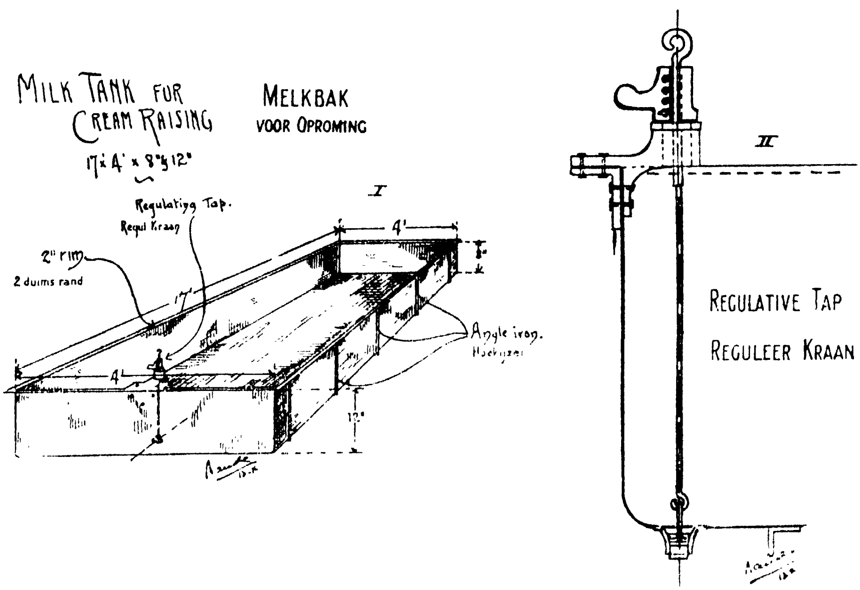


Plate VI.

Separator skim milk contains too little fat for this purpose and cannot be used without more ado. A few varieties of cheese are made out of pure separated milk, but only in small quantities. Further, such cheese is less suitable for our climate. Endeavours have been made to increase the fat in separator milk by adding cream or full milk, but this does not lead to the desired result. In this way you may get the fat in the milk, but you cannot replace the components lost in the separator slime during separation. Cheese made out of separated milk is always more or less brittle, of a less good quality, and I think this is due to the lack of the slime which constitutes a kind of glue for the particles of cheese. If you want to make cheese from the skim milk, the cream should be gathered in a less violent manner than by separation, and more fat must be left in the skim milk.

The oldest method I have mentioned in passing. The milk was poured in large shallow basins, and after a time the cream was ladled off with skimmers. If no cheese was made from the skim milk, then the milk was left till the cream formed a fairly thick layer which was pushed off with a stick. If cheese was to be made from the skim milk, then the cream was taken off after twelve hours by means of skimmers.

This method was improved in 1863 by a Swede, Mr. Gustaf Swarz. Instead of shallow basins, he introduced oblong creaming vats of about 20 inches in height, and of a capacity of about 6 to 12 gallons. These are placed in tanks containing cold water or ice.

The American Cooley system shows some similarity to the Swarz system, but in the former the creaming vats are round, are covered with a lid, and are entirely immersed. A Swarz vat can be seen on plate V, fig. 3. Both systems form an improvement on the old method; they give, after twelve hours, a skim milk suitable for cheese-making. The Swarz system has been largely adopted in creameries making butter and cheese, but it has grave faults. In spite of the use of ice, refrigeration is very slow, and cream and milk are kept for a long time at a high temperature.

In 1895 I investigated in how far refrigeration on the Swarz system goes in practice. The temperature of the skim milk was taken after skimming in a large number of Swarz vats. In order to limit the number of figures, I will only quote the highest and lowest temperatures noted. The temperature in the milk-room, where the investigation was carried out, varied during that period from 15° to 19½° C. (59° to 67° F.).

Date.	Lowest C.	Lowest F.	Highest C.	Highest F.
August 17	10	50	15	59
,, 18	11	52	15	59
,, 19	9	48	17½	63½
,, 20	11½	52½	17½	63½
,, 21	12½	54½	15	59
,, 22	11½	52½	15	59
,, 23	11	52	17½	63½
,, 24	11½	52½	15	59
,, 25	11½	52½	15	59
,, 26	11½	52½	14	57
September 1	10	50	14	57
,, 2	12	53½	15	59
,, 3	13	55½	15	59
,, 4	10½	51	15	59
,, 5	12	53½	15	59
,, 6	11½	53	15	59
,, 7	11	52	15	59
,, 8	11	52	15	59
,, 9	12	53½	14½	58
,, 10	12	53½	14½	58

Considering that ice was being used for refrigeration, it is evident that refrigeration was very inadequate. The most suitable refrigeration temperature for milk intended for butter and cheese making is

slightly under 5° C. (about 40° F.), and for refrigeration limits I would propose 3° C. (37½° F.) as the lower limit and 10° C. (50° F.) as the higher limit.

In order to obtain a better skim milk for cheese-making, and, at the same time, a good cream for butter-making, I evolved a system which I will describe concisely. Directly after reception the milk runs over large circular coolers (see plate V, fig. 2), and from there into long shallow tanks. These tanks are about 20 ft. long, 4 ft. 6 in. wide, 8 in. deep at one end, and at the other 12 in., which gives a good slope to the bottom (see plate VI, fig. 1). I had a special tap constructed (plate VI, fig. 2) which allowed of regulating the flow to a nicety.

The milk is cooled suddenly on the coolers, then stands quietly for 12 hours in the shallow tanks for creaming. The cream-gathering itself is very simple. The regulative tap is opened, and the skim

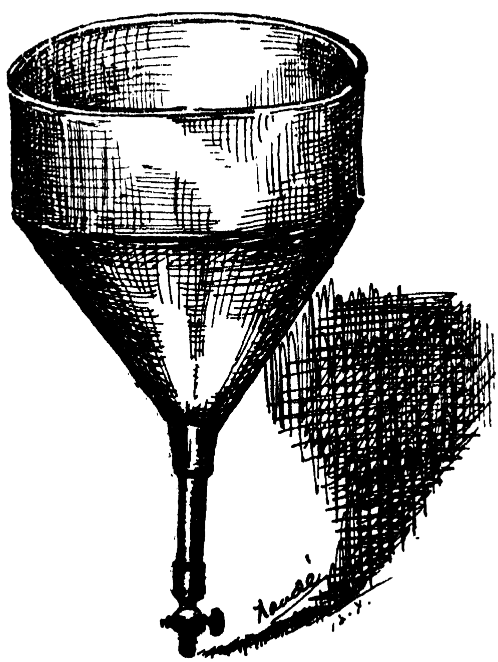


Plate VII. Colonial Apparatus for Cream Gathering.

milk runs out; as soon as the cream begins to come the tap is closed, after which it is opened entirely and the cream runs out. Comparative experiments have shown that this yields a finer cream for butter-making and a better skim milk for cheese-making. By arranging the regulative tap you can regulate the amount of fat in the skim milk. Experiments showed the possibility of varying the fat percentage of the skim milk from 0.75 per cent. upwards, and this is all that can be desired for practical work.

This system is not yet perfect either, and could be improved. It has the fault that, on hot days, the temperature of the milk in the tanks will rise 2° to 3° C. (3.5° to 5° F.). This could be

avoided by insulating the tanks, but insulation would be very expensive. For cheese-making this system proved to be a great improvement on the Swarz system.

As a curiosity I will mention a system of cream-gathering that is in use on a few farms in Cape Colony. The milk is poured into a vessel with a funnel-shaped bottom ending in a tube with a tap. To the milk in the vessel an identical volume of water is added, the mixture is left for a few hours, the watered skim milk run off, after which the tap is closed and the cream kept separate (see plate VII). The objections to this system are obvious. It is certainly possible to obtain the cream quicker than with the old method, for the cream will rise quicker on the diluted milk. But the addition of water to milk is always a questionable proceeding on account of the danger of contamination with bacteria and foreign bodies in the water. Further, the strongly diluted milk has lost a great deal of its feeding value.

Resuming the foregoing, I can say that those who aim at butter-making only should use one of the best separators. If the object is to make butter and skim-milk cheese, then I should prefer the described system of a cooler with shallow creaming tank.

Testing Eggs.

WHEN poultry-keepers are hatching artificially they are usually very accurate in looking at the thermometer several times a day, and they run it between 102 and 104 degrees, but they are not so particular on this point when hens are sitting. When hens are not kept up to the proper heat many of the chickens die in the shell up to the fourteenth day, particularly those which are on the outside of the nest, which are frequently down as low as 70 degrees. If a poultry-keeper is a little undecided as to whether there is sufficient heat in the hen's body or not, it is well to put a small thermometer under the breast for half an hour, then look at it quickly because the temperature soon goes down. It should run from 100 to 102 degrees, but occasionally it will be up to 103 degrees. When the hen is not eating well, on a cold night the temperature will often drop down to 80, 90, and 95 degrees. It is very necessary eggs should be tested, particularly during the cold weather, to see whether they are fertile or not or the chickens have died in the shells at early stages. When they are clear they should be taken away at once. When the eggs are tested between the seventh and ninth days and the operator is not sure whether the chickens are alive or dead, they should be put back and tested again on the tenth or twelfth day. At the same time it is well to try one or two others which have live chickens in them. In this way the operator will soon be able to test them easily and tell at once whether the chickens are alive or dead.

The small end of the egg should be held in the right hand and the large end in the left before a lamp or candle so that only the egg can be seen with the naked eye; this is better than any egg tester.

If the chicken is alive in the shell the latter will look dark all over except at the large end, but if dead patches of light will be seen and the shell will look very cloudy.

The eggs should be gently turned round when being tested. Some of our readers may ask why they test the eggs at all. In the first place it is very important that eggs which have dead chickens in them should be removed, because when the hen comes off her nest these eggs grow cold at once and often injure the others which have live chicken in them. Then again those eggs which have dead chickens in them are taken away; other good ones can be put in their place.

Hens often do not begin to hatch the eggs before the twenty-second or twenty-third day, and many of them leave their nests altogether because they have not strength to sit out the time simply through improper feeding.

For the first seven or nine days they should be kept off the nest quite ten minutes when they come off to feed. The food should consist of barley and Indian corn mixed, and, if they do not eat much, a little hemp seed in addition should be given. When a sitting hen will eat corn she does not require soft food. Unless the weather is very cold the hen should be provided with a dust bath and water, and good sound grain should always be given her. Sitting hens should never be fed more than once a day, and this in the morning. When a sitting hen has diarrhœa it is a good plan to give a little dry rice if she will eat it, and mix half a teaspoonful of powdered chalk and a quarter of a teaspoonful of ground ginger with any kind of meal and put down her throat. This, as a rule, will stop the worst cases of diarrhœa.—*The New Zealand Farmer.*

Sterilizing Tobacco Seed Beds.

By W. H. SCHERFFIUS, M.S., Chief of the Tobacco and Cotton Division (Transvaal).

REPORT ON STERILIZING EXPERIMENTS CONDUCTED ON THE EXPERIMENT STATIONS OF THE TOBACCO AND COTTON DIVISION DURING THE SEASON 1909-10.

THE reason for sterilizing seed beds, the usual methods applied, and the method producing the best result are important questions and worthy of the careful attention of the tobacco planter.

Men, who have made a special study of the subject, are apparently generally agreed as to why the beds need sterilizing. They are also aware of the methods usually applied, but when approaching the question as to which method gives the best result, we find there is a difference of opinion. It is observed that promoters of new schemes for doing this work sometime jump to the conclusion that their method is the best, without being first in possession of sufficient data to substantiate their claim. The importance of this question, and the lack of experimental evidence from which to draw conclusions, led us to undertake a series of experiments on the Government Tobacco and Cotton Experiment Stations last season. The experi- different men, but the results are practically identical.

Why should tobacco seed beds need sterilizing? Because it has been proved that a faster and healthier growth of seedlings is secured on properly sterilized soil, the reasons for this being due to the fact that after the soil has been heated it is dryer and can be worked into a better seed bed. Subjecting the soil to excessive heat helps to break down chemical compounds in the soil and liberates plant food. If the soil is sterilized by burning wood or trash on it, plant food, such as potash salts, is left in the ashes of the burnt material, and when these ashes are mixed with the soil, all the plant food they contain, being in a water soluble form, is readily available for the young plants. Another good reason for sterilizing seed beds is to destroy the germs of the weed and grass seeds usually lodged in the surface soil. If weeds are allowed to grow in the beds, the young seedlings will certainly suffer.

Methods of Sterilizing Seed Beds.

There are, as explained below, four methods of sterilizing with heat that have been applied with varying degrees of success. They are:—

(1) Open fire method: This is accomplished by simply burning wood or other waste material on top of the soil, thus providing sufficient heat to destroy weed seeds to a depth of 2 or 3 inches.

(2) Roasting process: This is accomplished by digging up the soil and throwing it into a large receptacle and heating it until the soil attains a high temperature, approximately 212° F: the soil

is then replaced in the hole. A machine is manufactured and sold in America, under the name of the "Wyatt Tobacco Bed Burner", which is a patent movable device especially designed for this sterilizing work. The machine is made throughout of heavy sheet-iron, with adjustable wheel carriage so that two men can move it. The soil pan over the furnace is 3 feet wide, 9 feet long, and 4 inches deep. The soil is thrown into this pan, where it is roasted for about an hour. During the process, the soil is turned over with a long-handled shovel two or three times. A fire of wood brush or mealie stalks is kept going under the front end of the furnace. A block of soil 3 feet wide 9 feet long and 3 inches deep alongside the machine is shovelled up and put into the pan and baked as indicated above, then it is thrown back into the hole from whence it came and another similar block from the other side is treated in a like manner; by this time the block of soil covered by the machine is also sterilized. Thus it will be seen that at each setting of the machine a space of 9 feet square is sterilized. Under ordinary circumstances two men can sterilize 40 or 50 square yards in one day. If a dry soil is being treated less time will be required for each operation, and consequently more ground can be covered in a day, while, on the other hand, when dealing with a very wet soil, a longer time will be required for each operation. In South Africa the principal advantage of the roasting method of sterilization would be the economical use of fuel.

(3) Steaming process: This is acomplished by first preparing the seed bed, and then by means of a steam engine, and a specially constructed air-tight steam box of any convenient size, the steam is led by a pipe into the box, which is inverted over a portion of the bed. The steam pressure should be up to at least 120 lb. to begin with, and the steaming should continue over each portion of the bed for about fifteen minutes; the bed should then be allowed to dry properly before the seeds are sown.

(4) Hot water method: This is accomplished by first preparing the seed bed, then pouring boiling water on it till the soil is wet 3 or 4 inches deep. Wait three or four days and repeat the operation. After this do not sow the seeds till the bed has dried out properly, and the surface has been worked into condition.

Comparative Results.

1. Open Fire Method.
2. Roasting Process.
3. Steaming Process.
4. Hot Water Process.
5. Check or Untreated Plot.

As will be shown by the following experiments, the open fire method of sterilizing gave the best results. The roasting process came second, and was almost as good as the open fire method. The steaming process came third, and was not quite as good as the roasting process. The hot water method gave the poorest results of all, and was but little better than the check or untreated plot.

The accompanying reports, with illustrations from the officers in charge of the stations where these experiments were conducted, give the details of these experiments as they were conducted.

REPORT ON STERILIZATION EXPERIMENTS OF SEED BEDS BY H. W. TAYLOR, B.AGR., OFFICER IN CHARGE, TOBACCO EXPERIMENT STATION, RUSTENBURG.

A strip of land adjacent to the general seed bed was selected for the experiment. This land was used for seed beds last season, and after the plants had been transplanted, the beds were dug up and planted to garden peas. The required amount of land, 20 feet by 4 feet was measured off, and two wheelbarrow loads of well pulverized manure were spread on the soil; the whole was dug up to a depth of eight inches and well worked together. The land was then divided into five plots of equal size, each being 4 feet square The first square was treated by the open fire method, the space being covered with logs and the whole covered with straw. The logs were allowed to burn for one hour, and then what remained of them, as well as the large pieces of charcoal, was removed from the bed. The ashes remained on the bed and were dug under. Next the 20 feet by 4 feet space was enclosed with flooring boards to keep out insects; flooring boards were also placed cross-wise on the plot to separate the several divisions (see Plate No. 1).

The second square was treated with boiling water at the rate of six gallons to 4 square feet.

The third square was steamed by burying in the soil a tin "nose" attached to a rubber hose connected to a boiler. This process left the soil in splendid mechanical condition.

The fourth square was roasted. The soil was removed to the depth of 6 inches and placed in a galvanized-iron receptacle and thoroughly roasted until the soil registered the temperature of 212° F. It required constant mixing to thoroughly roast the soil.

The fifth square was left untreated.

After treatment, the soil was again dug up to a depth of 3 inches and put in good mechanical condition.

All the blocks were treated on 28th September, 1909.

Seeding.—The seed was sown on 29th September at the rate of 1 c.c. of seed to 4 square feet. The seed was not sown until the following day because the bed, treated with boiling water, had to partially dry out before the soil could be prepared for seeding.

Subsequent Treatment.—As soon as the seed was sown, the beds were watered with a sprayer and covered with grass mats, and after sowing they were watered daily.

4th October: The beds were covered with canvas, and the plants allowed to have sunlight early in the morning and late in the afternoon, the amount of sunlight being increased as the plants became larger.

Notes.—

9th October: Plants just beginning to appear.

11th October: Plants well up. Using a basis of 10 points as representing a perfect stand, the comparative results of the several plots scored as follows:—

	Plot No. 1.	Plot No. 2.	Plot No. 3.	Plot No. 4.	Plot No. 5.
11th October	10	8.5	9	9.5	8.5
19th October	10	8	8.5	9.5	8

Plants largest in No. 1, next largest No. 4, next No. 3, next No. 2, smallest No. 5.

26th October: Plants in No. 1 best, second best No. 4, third best No. 3, Nos. 2 and 5 about equal.

2nd November: Relatively the same as 26th October.

8th November: Relatively the same as 26th October.

15th November: Plants Nos. 1 and 4 show a decided gain over those in 2, 3, and 5 (see Plate No. I taken on the same date).

21st November: Plants in Nos. 1 and 4 still continue to show to better advantage than those in Nos. 2, 3, and 5; No. 1 best.

29th November: The difference between different blocks was more decided; No. 1 best, No. 4 second, Nos. 3 and 5 next, No. 2 poorest.

Number of weeds and grass found after each method of sterilization:—

	Open Fire.	Boiling Water.	Steamed.	Roasted.	Untreated.
Weeds	2	3	8	3	9
Grass	2	3	2	3	8

7th December: Plants in No. 4 show a more uniform growth than the others, but the plants are not as large as those in No. 1.

14th December: Some plants in No. 1 large enough for transplanting (see Plate No. II taken 9th December).

Plants transplanted or suitable for transplanting:—

	Bed No. 1.	Bed No. 2.	Bed No. 3.	Bed No. 4.	Bed No. 5.
21st December, 1909 ...	189	89	113	168	85
6th January, 1910 ...	200	170	180	190	200
17th January, 1910 ...	207	212	165	140	148
24th January, 1910 ...	61	69	80	91	71
Totals	657	540	538	589	504

24th January, 1910: Weeds and grass in beds:—

	Bed No. 1.	Bed No. 2.	Bed No. 3.	Bed No. 4.	Bed No. 5.
Grass	4	5	8	3	10
Weeds	3	7	4	4	9

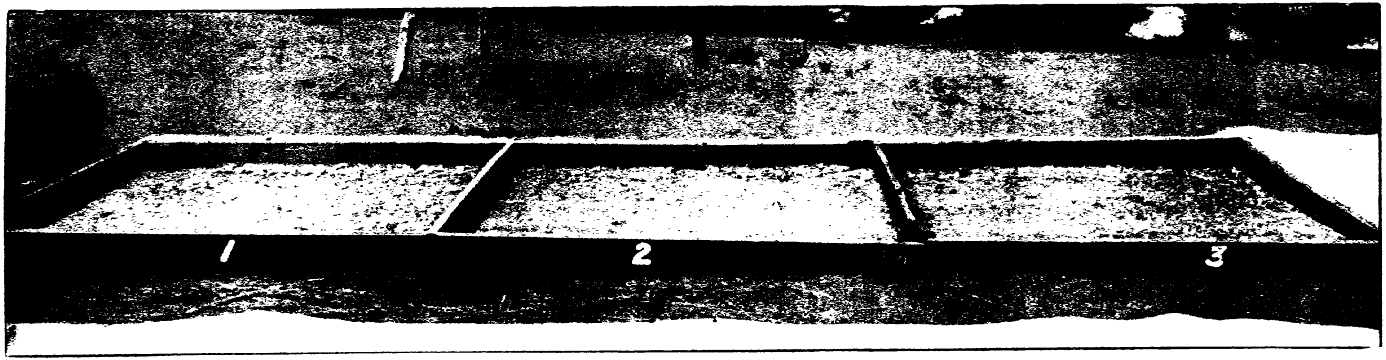
The grass has made a much stronger growth in No. 5 than in any of the other beds.

No plants were drawn for transplanting until they had formed four true leaves, not including bud leaves, and the plant at least 2½ inches high.

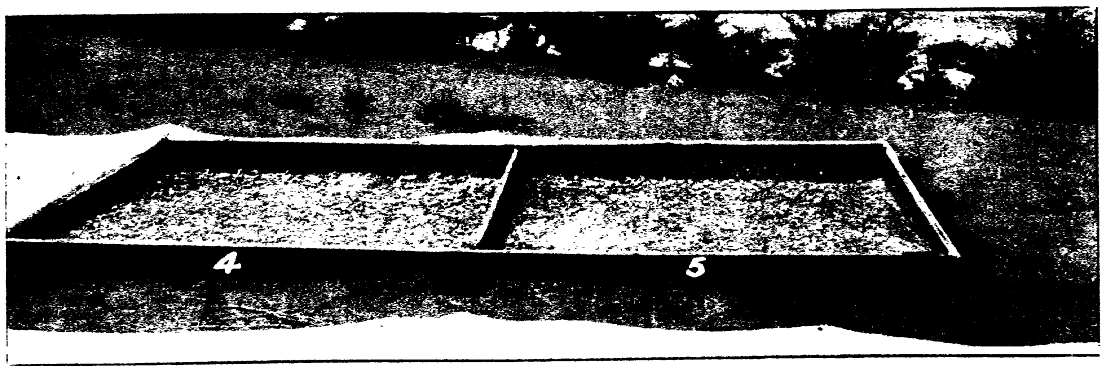
The difference in the total number of plants does not show accurately the effects of the different methods of treatment. The plants must be observed in the bed to note the real result of the different methods of sterilizing.

The plants in No. 1 had the best colour and strongest stems. Plants with the best root system were found in Nos. 1 and 4, the difference, if there was any, being slightly in favour of No. 4.

Sterilizing Tobacco Seed Beds.



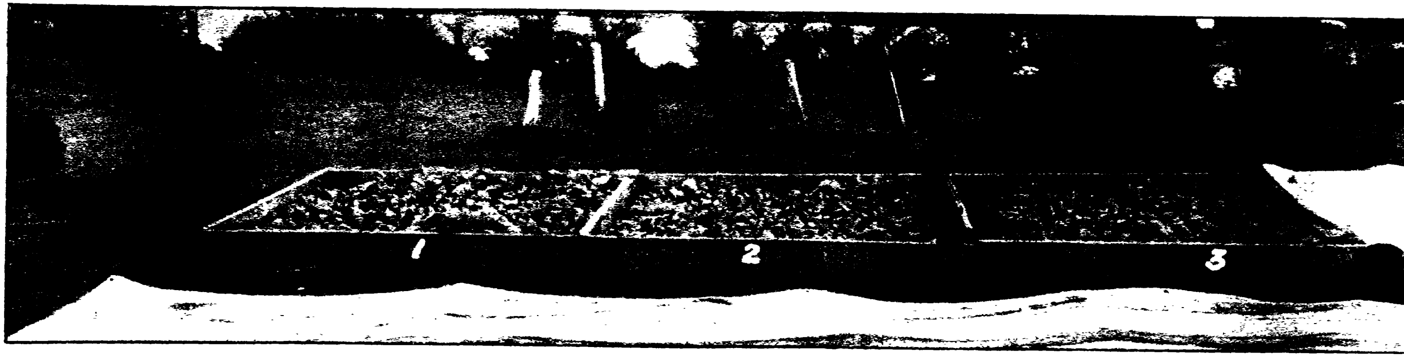
No. 1. Open fire. No. 2. Boiling water. No. 3. Steamed.



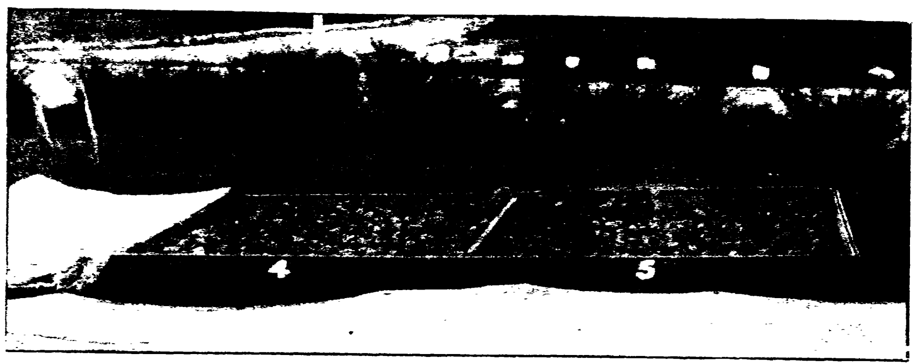
No. 4. Roasted. No. 5. Not treated.

Plate No. I. Sterilization Experiments—Government Experiment Station, Rustenburg. Photo by H. W. Taylor.

Ste zing Tobacco Seed Beds.

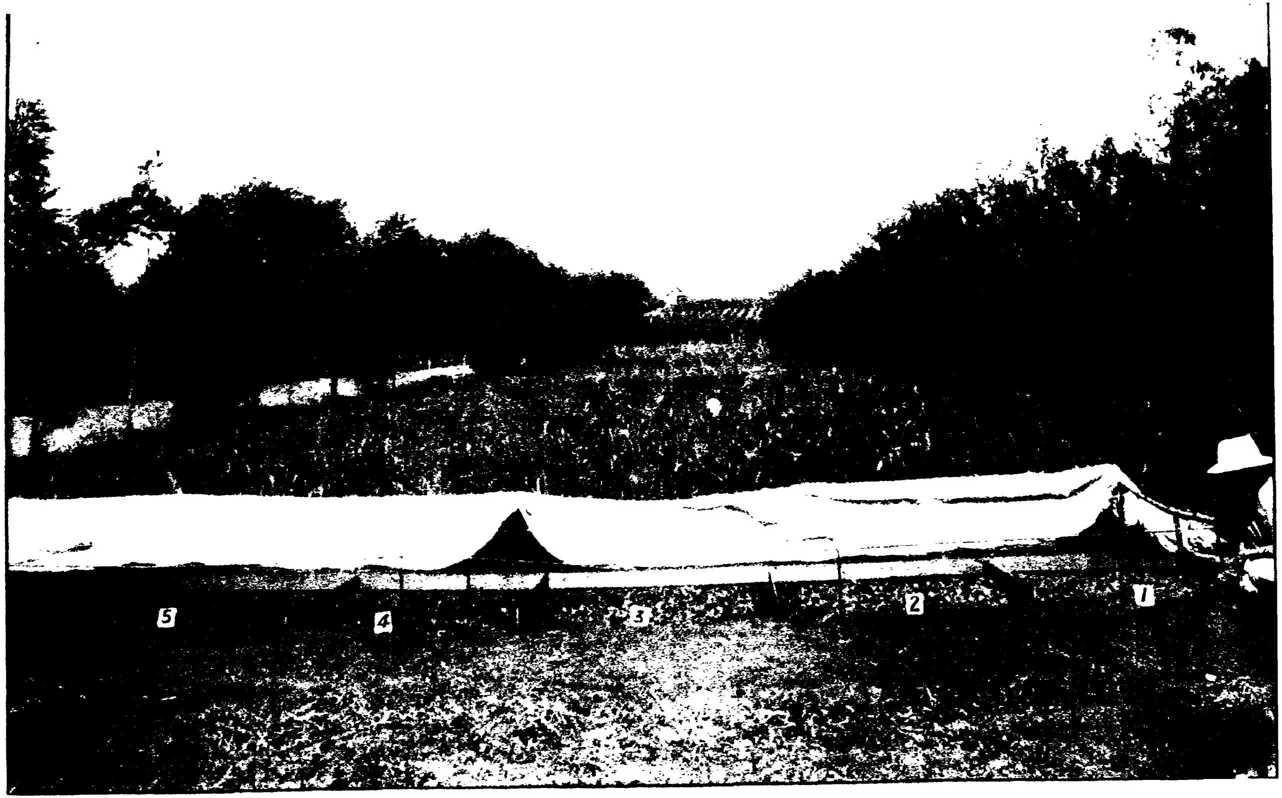


No. 1. Open fire. No. 2. Boiling water. No. 3. Steamed.



No. 4. Roasted. No. 5. Not treated.

Plate No. II. Sterilization Experiments—Government Experiment Station, Rustenburg. *oto by H. W. Taylo*



No. 5. Not treated. No. 4. Boiling water. No. 3. Roasted. No. 2. Open fire. No. 1. Steamed.

Photo by V. C. Brewer.

Plate No. III.

Sterilization Experiments Government Experiment Station, Barberton.

Ster ng Tobacco Seed Beds

No. 3. Roasted. No. 2. Open fire. No. 1. Steamed.

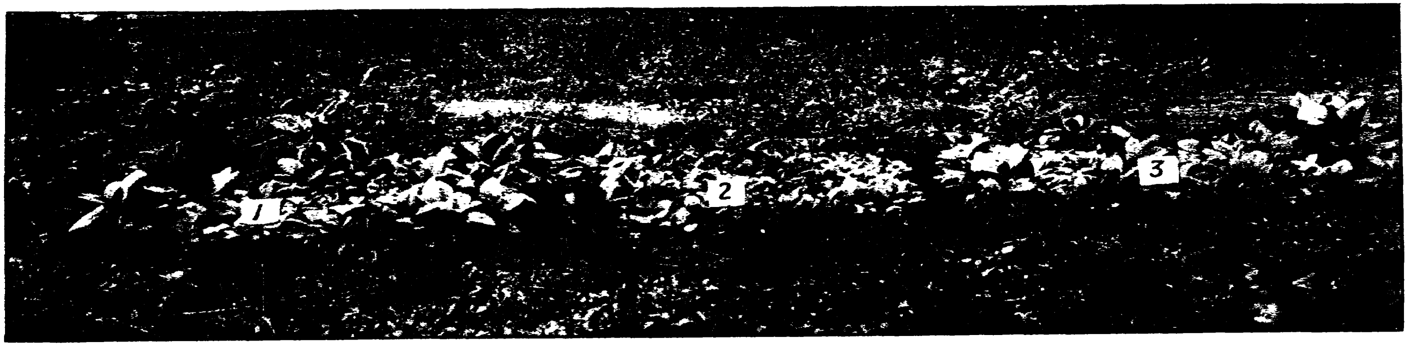
No. 5. Not treated. No. 4. Boiling water.

Plate No. IV.

Sterilization Experiments—Government Experiment Station, Barberton.

Photo by V. C. Brewer.

Ste zing Tobacco Seed Beds



No. 1. Open fire. No. 2. Boiling water. No. 3. Steamed.

No. 4. Roasted. No. 5. Not treated.

Plate No. V. Sterilization Experiments—Government Experiment Station, Tzaneen. Photo by O. B. Chisholm.

Botanical Illustrations.

Photos by Jos. Burtt-Davy.

FIG. 1. Sisal Hemp (*Agave sisalana*) at Pruizen, Potgietersrust. C. Hamilton. Transvaal Consolidated Land and Exploration Co.
FIG. 2. Marola Tree (*Sclerocarya caffra*) in winter at Pruizen, Potgietersrust.

Photo by Jos. Burtt-Davy.

Bark of the Kameel-doorn (*Acacia giraffae*).
Smit's Kraal, Christiana, 9th September, 1910.

Photos by W. F. Davis.

The Jointed Cactus (*Opuntia pusilla*).

A. Young plant showing roots.
B. Branch of old plant.

The soil in No. 4 was more friable and in better mechanical condition generally than was that of any other bed.

Insects did not injure any of the plants. The roots were carefully examined but no trace of nematode or eel worm could be found in any of the beds.

General Remarks.—The land was fairly clean, having been used for plant beds the previous season, and also for garden peas, and therefore did not show accurately the effect of the different methods as regards the growth of weeds and grass.

The experiment has been shown to numerous visitors, and, without exception, all have said that No. 1 was the best, with No. 4 second.

REPORT ON STERILIZATION EXPERIMENTS OF SEED BEDS BY O. B. CHISHOLM, OFFICER IN CHARGE, TZANEEN EXPERIMENT STATION.

Plot No. 1, Open Fire Method: Germination good; very large plants, with dark green colour, showing vigorous growth though uniformity not very good. Stalks are short and strong and of good colour.

Plot No. 2, Boiling Water Method: Medium germination, plants also of medium size, and of a light colour. Uniformity about the same as plot No. 1, stalk inclined to be slender and have a very light colour.

Plot No. 3, Steaming Method: Good germination, size of plants about the same as plot No. 2. Uniformity good, better than plots 1 and 2; colour good, stalks inclined to be slender and of light colour.

Plot No. 4, Roasting Method: Good germination, size of plants same as plots Nos. 2 and 3, but uniformity bad, colour light, stalks very slender and white.

Plot No. 5, Not Sterilized: Excellent germination, plants very small and yellow, uniformity very good, better than any other plot, stalks very slender and white. (Plate III shows comparative growth.)

Remarks.—Plot No. 1 has the best plants of any, but taking the bed as a whole the uniformity is not so good as Plots Nos. 3 and 4.

The uniformity of Plot No. 5 is very good, though the plants are the smallest of the lot, and seem too weak to be of any use.

Effect of experiment on insects.—Plot No. 1, Open Fire Method: Only a small percentage of the plants are affected by the nematode or eel worm, while the dikkop attacked the plants severely.

Plot No. 2, Boiling Water Method : The nematode affected approximately fifty per cent of the plants, while the attack of the dikkop was very slight.

Plot No. 3, Steaming Method: The percentage of plants affected by insects was comparatively small.

Plot No. 4, Roasting Method: The attack of the nematode was slight, while that of the dikkop was very severe, about the same as Plot No. 1.

Plot No. 5, Not Sterilized: The percentage of affected plants was small, about the same as plot No. 3.

REPORT ON STERILIZATION EXPERIMENTS ON SEED BEDS BY V. C. BREWER, OFFICER IN CHARGE, EXPERIMENT STATION, BARBERTON.

Plot No. 1, Steaming Process.
Plot No. 2, Open Fire Method.
Plot No. 3, Roasting Process.
Plot No. 4, Boiling Water Process.
Plot No. 5, Check Plot, not treated.

18th October: The ground was dug to a depth of 5 inches, then raked level.

Plot No. 1 was steamed by burying perforated steam pipes about two inches below the surface, then a tarpaulin of four thicknesses was laid on top to prevent the steam escaping from the soil. A pressure of 40 lb. was maintained in the boiler, and steam was allowed to escape through the pipes for about fifteen minutes. To ascertain when the soil was sufficiently treated, a potato was placed in the soil, and when it was thoroughly cooked the steam was turned off.

Plot No. 2 was treated by piling wood on the surface and then burning it. A similar test of the amount of heat required to cook a potato, buried 3 inches below the surface, was applied.

Plot No. 3: The soil was removed to a depth of 3 or 4 inches, and was placed on corrugated iron sheets fixed over the fire; the same test with a potato was used on plot No. 3 as in plots Nos. 1 and 2, to determine when the soil had been sufficiently roasted. Plot No. 4 was treated with boiling water, which was heated to boiling point in paraffin tins, and poured over the plot. Plot No. 5 was not treated.

19th October: The plots were allowed to remain a day, and commercial fertilizers were then applied in the ordinary way.

20th October: Beds raked and seed sown.

28th October: The seed in all the plots had germinated, but there was no perceptible difference in the different plots.

12th November.—Plot No. 1: Few weeds in plot, plants very healthy and uniform.

Plot No. 2: No weeds, perfect germination, plants very healthy.

Plot No. 3: Much the same condition as Plot No. 1, plants exceedingly healthy.

Plot No. 4: More weeds than tobacco plants; seedlings somewhat yellow.

Plot No. 5: Plants germinated as well in this plot as the others, but weeds seem to have choked out the plants, which are of a very yellow colour.

27th November.—Plot No. 1: Plants very healthy and vigorous, only a few weeds.

Plot No. 2: Plants very healthy and vigorous, and by far the best growth, half again as large as other plots.

Plot No. 3: Plants healthy and vigorous, in much the same condition as Plot No. 1, only a few weeds.

Plot No. 4: Weeds have outgrown plants, plants very small and yellow in colour.

Plot No. 5: Overgrown with weeds, plants very yellow, no sign of disease or nematode on roots.

After all weeds had been removed, Plot No. 4 had about half as many plants as Nos. 1, 2, and 3, while Plot No. 5 had only about one-quarter the number of Nos. 1, 2, and 3. (See Plate No. IV.)

20th December.—Planted ten plants from each plot in another plot 20 feet square, which contained nematode, in order to determine comparative results of each treatment.

Plants from Plots Nos. 1, 2, and 3: Absolutely free from nematode or any other disease at the time of transplanting.

Plots Nos. 4 and 5: Plants showed indications of nematode on their roots at the time of transplanting.

6th January.—Beds photographed for the last comparison. (See Plate V.)

21st January.—All plants removed from plots.

Plot No. 1: Very few nematode noticeable on the roots of the seedlings.

Plot No. 2: No nematode noticeable.

Plot No. 3: Few of the roots of the seedlings show nematode.

Plot No. 4: Most of the plants affected with nematode.

Plot No. 5: All plants badly affected with nematode.

Plot 20 feet by 20 feet planted with plants from Plots Nos. 1, 2, 3, 4, and 5 were all affected more or less with nematode.

Notes on Illustrations.

By JOSEPH BURTT-DAVY, F.L.S., Government Botanist (Transvaal).

1. Sisal hemp (*Agave sisalana*). This photograph was taken on the farm Pruizen, Potgietersrust, Waterberg District, owned by the Transvaal Consolidated Land and Exploration Company, and managed by Mr. C. Hamilton. This is the first farm on which velvet beans were grown on a large scale in South Africa and which furnished much of the seed used in the country during the last few years.

Tobacco, cotton, teff grass, and maize do well here. Soy beans are being grown this year as an experiment in the renovation of worn-out maize lands. Sisal hemp has been grown experimentally during the last three years, and is proving quite promising, as the illustration shows. Photo by Joseph Burtt-Davy.

2. Maroola tree (*Sclerocarya caffra*) in winter garb. This fine specimen of the maroola is also growing on the farm Pruizen. The fruits are edible, and are used by the natives to make a sort of Kaffir beer. The large "stone" contains a meaty kernel, which is edible; it appears to have a high oil content. Mr. W. H. Schneider reports having set light to some of the stones, which burned freely like a candle. These nuts might form a profitable source of commercial oil if means can be found to extract the kernel from the hard, thick mesocarp. Photo by J. Burtt-Davy.

3. Kameeldoorn (*Acacia giraffae*). Some difficulty is experienced in the identification of the different kinds of thorn-tree (acacia) when not in fruit, owing to the large number of species. The bark of some of them is quite characteristic, and forms a ready means of identification to the initiated. This particular species is named after the cameleopard, or giraffe, which is said to browse on its foliage. The wood is hard and heavy, the heart-wood of a dark brown colour. Burchell states that the Bechuanas used it for making spoons and knife handles, etc. By white people it is principally used for fuel. As much as 10,000 tons of fuel, mostly of this species, is said to have been taken to Vryburg alone during some years. Kimberley has also been responsible for the destruction of large quantities. In the early days of mining in Kimberley, when the kameeldoorn was plentiful in the vicinity, the hard heart-wood was used as bearings for machinery shafts. It is stated by old residents that, when well-oiled, it outlasted brass fittings for this purpose. The kameeldoorn grows mainly in the south-western and western parts of the country with a summer rainfall of 15 in. to 20 in., and is found on sandy soils. Growth is said to be very slow. The large pods are mealy within, and are said to be eaten by stock and buck, as is also the foliage. Photo by J. Burtt-Davy.

4. Jointed cactus (*Opuntia pusilla*). A dangerous weed, becoming common in parts of the Cape Province, and recently found near Pretoria. It is suggested that this plant should be proclaimed a noxious weed throughout the Transvaal Province, in terms of Act No. 12 of 1909, with a view to preventing its introduction into other districts. In the Province of the Orange Free State the jointed cactus was proclaimed in the original schedule under the Noxious Weed Act. Photo by W. F. Davis.

5. Tall fescue (*Festuca arundinacea*). This is proving far and away the best winter grass introduced by this department. It grows freely and keeps green in winter, and spreads from self-sown seed if rested during the seeding season. It does best in somewhat heavy soils. Farmers are advised to give it a trial. Small lots of seed can be had on application. The best time to sow is during the latter half of January and throughout February. Drawing by Miss Stent.

6. Lamb's-tongue plaintain (*Plantago lanceolata*). A useful winter feed for sheep. Drawing by Miss Stent.

Tall fescue (*Festuca arundinacea*).

The best winter-pasture grass for the Transvaal high veld.

FIG. 1. Spikelet in bud. FIG. 2. Spikelet in full flower.

Lamb's-tongue or Rib-grass Plantain (Smalle Weegbree).
(*Plantago lanceolata.*)

Some Notes on Bee-Plants.

By JOSEPH BURTT-DAVY, F.L.S., F.R.S.S.A., Government Botanist (Transvaal).

SEVERAL inquiries have reached me lately as to the best plants to grow for nectar for domestic bees. This indicates that bee-keeping is now receiving more of the attention which it deserves.

Owing to the increase of the work of this division, the subject of bee-plants has had to be subordinated to other and more pressing problems demanding our time. Notes have been made in the field, but we have not had sufficient clerical assistance to both keep pace with our growing correspondence and to extract, classify, and file all the data accumulated.

The following preliminary notes are published in the hope of assisting those who are starting bee-keeping, and, at the same time, of eliciting correspondence and further information from other observers. We need much more information about the native plants visited by bees. Observers who want to know the names of such plants may send them, post free, addressed to the Government Botanist, Pretoria, when we shall always be glad to name them.

Supplementing my own necessarily incomplete observations, Mr. V. L. Robertson, of Amersfoort, and Mr. Thomsen, of the Division of Entomology, have most kindly furnished valuable data which have been incorporated.

ANNUALS.

The following plants are annuals and may therefore be sown at intervals during the season which suits them best, and thus provide a more or less continuous crop of flowers:—

Borrage (*Borrago officinalis*).

Buckwheat (*Fagopyrum esculentum*). Generally recognized as one of the best bee-plants; can be sown in succession. The grain can be used for poultry.

Ramtil (*Guizotia oleifera*). Attracts many bees.

Sorghum (*Sorghum saccharatum*). Much attacked by aphides, which produce a honey-dew very attractive to flies and bees; being an excrement and not a nectar, it may not be as wholesome as true honey.

Cosmos (*Cosmos bipinnatus*). Perhaps visited for pollen only.

Coreopsis (*Coreopsis Drummondii*). Visited by bees in November.

Cotton (*Gossypium* spp.). Ornamental garden plant.

Sunflowers (*Helianthus annuus* and other species). December-January.

Lupins (*Lupinus* spp.). Can be grown in winter.

Bokhara clover (*Melilotus alba*).

Mignonette (*Reseda odorata*).

Nasturtium (*Tropaeolum majus*).

Alkanet (*Anchusa officinalis*). Naturalized near Kroonstad.
Hairy vetch (*Vicia villosa*).
Broad bean (*Faba vulgaris*).
Maize (*Zea Mays*). Visited for pollen only.
Peas (*Pisum sativum*). Good honey yielders.
Beans (*Phaseolus* spp.). Good honey yielders.
Sweet pea (*Lathyrus odoratus*).

Rape (*Brassica napus*). Can be sown latter part of summer (January on) to furnish late autumn bee feed and winter grazing for sheep.

California poppy (*Eschscholzia crocea*). Honey and pollen. September-November.

Cape and American gooseberries (*Physalis peruviana* and spp.). Good honey yielders. (V. L. Robertson.)

Asparagus spp. (both wild and garden forms) are very attractive to bees and reported by Mr. Robertson to be good honey yielders.

Pumpkins and other cucurbitaceae. Mr. Robertson notes that a single pumpkin flower yields more nectar than a single bee can take in one load, and that though the bodies of bees are often covered with pollen-dust, they do not gather much pollen from pumpkins. Perhaps the form of the pollen is objectionable to them. The flowers are large, but the number produced is relatively small.

HERBACEOUS PERENNIALS.

These being planted once, remain permanently or for several years at least. They usually flower about the same time each year.

Lucerne (*Medicago sativa*). One of the very best bee-plants. If cut monthly it will produce a succession of flowers each month from September to May. Cuttings can be arranged in such a way that some portion of the plot will always be in flower.

Dutch clover (*Trifolium repens*). An excellent bee-plant; must be grown under irrigation. Flowers in winter.

Cow-grass clover (*Trifolium pratense perenne*). Must also be grown under irrigation.

Gaillardia (*Gaillardia pulchella picta*). Honey and pollen. December. A great favourite.

Sulla (*Hedysarum coronarium*). Suited to the bushveld.

Cigar plant (*Cuphea micropetala*). December. Mr. Thomsen reports that this is an excellent bee-plant.

Sainfoin (*Onobrychis sativa*). Thrives on soils rich in lime. Flowers November.

Serradella (*Ornithopus sativus*). Flowers in winter.

Lavender (*Lavandula* spp.). Flowers December.

Daisy (*Chrysanthemum lacustre*). November-December. Visited by bees.

Blepharis (*B. dilatata* and *B. inaequalis*?). Mr. Thomsen reports that a blue-flowered species occurring near Rustenburg is visited by bees.

Pentstemon (*P. gloxinioides*). Flowers September to January. Visited apparently for pollen only.

Foxglove (*Digitalis purpurea*); biennial. Bees pierce the base of the tube from the outside to get at the nectar. Flowers October and November.

Dahlia (*Dahlia variabilis*). A good yielder of honey and pollen. (V. L. Robertson.)

Violets (*Viola odorata*). Visited by bees. (Mr. Thomsen.)

Thyme (*Thymus vulgaris*), Sage (*Salvia officinalis*), and other "garden herbs" are reported by Mr. Robertson and Mr. Thomsen to be good honey yielders.

SHRUBBY PLANTS.

These flower about the same time each year.

Bird-of-paradise acacia (*Caesalpinia Gilliesii*) November-January. Visited by bees both for honey and pollen.

Honey plant (*Melianthus major*). Native of the Cape Province; rich in nectar. Visited by birds, perhaps not by bees.

Spanish broom (*Spartium junceum*).

Poison-bush (*Acokanthera venenata*). Flowering end of July; is very fragrant and may be a bee-plant.

Salie-hout (*Buddleia salviaefolia*). Native of the Transvaal; powerfully fragrant. Flowers about August.

Tagasaste or tree lucerne (*Cytisus proliferus albus*). Ten feet high. Flowers white in winter.

Sugar-bush (*Protea* spp.). Natives of South Africa.

Gorse or furze (*Ulex europaeus*). Flowers very fragrant.

Perfumery roses (*Rosa damascena* and *R. gallica centifolia*). Make an excellent white honey. (Mr. Thomsen.)

Aloes, wild (*Aloe* spp.). Some of these species produce a great deal of nectar, which is greedily taken by sunbirds (especially *Chalcomitra amethystina*), and, in the case of *Aloe castanea* at least, is readily accessible to hive bees, which freely visit the flowers, but as far as I have been able to observe the bees gather the pollen only. Most of our species of aloe flower in July and August. They are easily grown, and form ornamental additions to the flower garden.

American aloe or garen-boom (*Agave americana*).

New Zealand flax (*Phormium tenax*).

Adam's needle (*Yucca* spp.). The species grown in Pretoria is *Yucca aloifolia*, a native of the West Indies. It flowers November-December. I have only rarely seen bees at it.

CLIMBERS.

The wistaria (*Wistaria sinensis*) is an early spring (August) flowering climber, very fragrant, and much visited by wild bees.

The mandevilla (*Mandevilla suaveoleus*) and honeysuckle (*Lonicera japonica Halliana*) are very fragrant, but I have not seen bees at them.

The grape vine (*Vitis vinifera* and spp.), flowering October and November, is very fragrant and much visited by bees.

Landolphia capensis, which flowers on the Pretoria kopjes in August, is fragrant, and may be a honey plant.

TREES.

The following shade, ornamental, or fruit trees are useful for bees:—

Oranges and naartjes (*Citrus* spp.). Flower in winter and early spring.

Peach, apricot, plum, and nectarine (*Prunus* spp.). Flower July to September.

Loquat (*Eriobotrya japonica*). Winter flowering.

Pepper tree (*Schinus molle*). October-December. Perhaps visited for pollen only.

Black locust (*Robinia pseudacacia*). A favourite bee-tree in Europe.

Eucalypts of sorts (*Eucalyptus* spp.). Several species are winter flowering and furnish a great deal of nectar.

Thuja compacta and several species of cypress (*Cupressus* spp.) yield pollen from mid-winter to spring. This stimulates brood rearing, which, however, may not always be desired at that time of year. (V. L. Robertson.)

The thuja hedges are much affected by aphides, which secrete a dark honey-dew much sought by bees. (Mr. Thomsen.) It is not known whether the honey produced is injurious, but honey-dew is not nectar.

Weeping willow (*Salix babylonica*). The greatest honey yielder on the high veld, but, flowering as it does for only about fourteen days in spring, when the bees are weak and the weather often cold and windy, very little gain is made in the supers. It was noticed that, in June last, a number of old, well-grown willow trees gave a second crop of flowers, which made a considerable gain in the supers. (V. L. Robertson, November, 1910.)

Poplars, French or Lombardy (*Populus nigra*, var.) Old large trees produce an abundance of dark red pollen for about six days in December, which is valuable, as the fruit blossom is just coming at the same time. (V. L. Robertson.)

Oak (*Quercus pedunculata*). A very great pollen producer during fruit blossom time, and, consequently, very valuable. (V. L. Robertson.) Attacked by aphides which produce honey-dew. (Mr. Thomsen.)

Beukenhout (*Faurea saligna*). Reported by Mr. Thomsen.

Tree euphorbia (*Euphorbia Cooperi*). It is stated that the flowers are much visited by bees in early spring and that the honey produced from them is poisonous, but I have no evidence of this.

Silky oak (*Grevillea robusta*). Produces large quantities of flowers in October.

Seringa (*Melia Azedarach*). Very fragrant. Flowers in early spring.

Banana and Plantain Fibre.

By JOSEPH BURTT-DAVY, F.L.S., Government Botanist (Transvaal).

CONSIDERABLE interest is being shown at the present time in the question of fibre plants suitable for South Africa. Frequent inquiries are received by this department as to sisal, New Zealand flax, manila, ramie, and many other fibres. These inquiries all tend to show that South Africa is awaking to the need of developing her own resources. Whether the time is quite ripe for starting local manufactures depends on economic considerations which are beyond the scope of the present article and involve questions of labour, machinery, cost of importing chemicals, etc., on which the opinions of textile technologists are required.

An article on the subject of ropes from plantain fibre appeared in the *Rand Daily Mail* of 20th September, 1910, and has led to inquiries on the subject being addressed to this department. The plantain referred to is the Arakan plantain of India, *Musa arakanensis*, a special form of plantain valued both for its fruit and fibre.

Plantain Fibre (*Musa paradisiaca*).—The plantain is considered a valuable plant for paper-making, and its fibre might possibly be extracted for this purpose alone at a considerable profit. The fibre of the Indian plantain has been tested and proved of excellent strength, but not equal to that of manila hemp, which is obtained from *Musa textilis* of the Philippines. It is suitable for many purposes of cordage and canvas, and some of the finer kinds for textile fabrics "of fine quality and lustre". Plantain fibre is whiter and finer than ordinary banana fibre, and approaches more nearly to the fine glossy character of manila hemp. A stem weighing 25 lb. yielded, in Jamaica, only 7¼ oz. of cleaned fibre, or 1.81 per cent. of the gross weight. In Demerara it has been found that the stems can be cut every eight months; an acre will yield 1400 to 1500 good stems every cutting, or about 4500 in two years. The stem averages 80 lb. in weight. One stem yields, on an average, 2½ lb. clean fibre and 1½ lb. discoloured and broken fibre, the latter only fit for coarse paper. This result was obtained, however, with only very imperfect machinery.

Banana Fibre (*Musa sapientum*).—Fibre extracted from the stalks of Florida-grown banana plants has been tested and pronounced to be very weak. Specimens from farther south (more tropical localities) were better, but did not approach in strength the fibre of manila hemp. In Trinidad the stalks grow 8 ft. to 9 ft. high; 800 are grown to the acre, and 5 lb. to 6 lb. of fibre produced from each stalk. In Jamaica a banana stem, weighing 108 lb., yielded only 25 oz. of cleaned fibre, or 1.44 per cent. of the gross weight. A sample of fibre prepared in Trinidad in 1886 from the red banana, was valued in London at £24 to £25 per ton. Usually, however, banana fibre is not worth more than £12 to £15 per ton, and these prices would only be obtained when there was a high demand for "white-hemp fibres", and when there happened to be a short supply

of manila and sisal hemps. A sample from British Guiana was valued, in 1892, at £25 per ton, but usually the price is much lower, and when manila and sisal are low in value, banana fibre is practically unsaleable.

Abyssinian Banana (*Musa Ensete*).—Fibre extracted from this banana in Jamaica yielded 1.16 per cent. of the gross weight. The fibre was somewhat weak and dull looking; it had none of the lustre of the best plantain fibre, and was valued in London at £12 to £14 per ton.

Japanese Banana (*Musa Basjoo*).—This yields a coarse white fibre used for weaving a special cloth valued for summer undershirts, being lighter by about three-fourths to three-fifths than the weight of hemp or flax, and which does not stick to the skin. This fibre is 4 ft. to 5 ft. long, bright and lustrous, and possesses fair strength.

Transvaal Banana, or wilde pizang (*Musa ventricosa*).—This grows wild in the Zoutpansberg on the eastern slopes of the Houtboschberg up to about 3500 ft. It propagates from seed, and the plant dies after flowering, as is the case also with the Abyssinian banana. Unfortunately, the quantity available seems to be limited. Unless the fibre is particularly good, it would not pay to cultivate the species, as the fruit is not eatable; it would be more profitable to grow the banana or plantain, which thrives in the same localities. The fibre is worth investigation, however.

Extraction and Preparation.—Banana and plantain fibre can be prepared by any of the ordinary scraping machines now in use; the chief difficulty appears to be found in dealing with the large percentage of water in the stem. One hundred stems can be crushed in twenty minutes with one horse, allowing five minutes for rest.

After crushing the fibre is boiled to separate the gluten and colouring matter. Carbonate of soda and quicklime are used as chemical agents. To prepare three tons of fibre per day requires four boilers of 800 gallons capacity each, and to give five boilings in a day, which gives 1650 lb. fibre, net, for each boiler, or 6650 lb. for the four boilers. About 300 lb. of soda are required, and a proportionate amount of quicklime. The different grades of fibre are pressed separately, and are kept separate in the process of boiling. The lighter fibres require about six hours to bleach, while the darkest require fully eighteen hours.

Fifty years ago there was an extensive industry in the preparation of banana and plantain fibre in the island of Jamaica. A capital of £5000 was required for carrying on the cultivation of the plantain on an extensive scale, eighteen tons of fibre being produced on 5½ acres at a cost of about £175, or a little under £10 per ton. Apparently the low prices obtained for the fibre made the industry unremunerative, for it seems to have ceased to exist many years ago.

In India the chief difficulty in the utilization of plantain stems as sources of fibre or as paper material, is the expense of collecting and carting to the factory.

References.—I am indebted to Mr. C. R. Dodge's valuable descriptive catalogue of useful fibre plants of the world for much of the above information. Useful data are also contained in the following: "Commercial Products of the Vegetable Kingdom", P. L. Simmonds, London, 1854; "The Textile Fibres of Commerce", Hannan; "The Commercial Products of India", Watt.

Winter Pasture Grasses in the Standerton District.

By J. A. T. WALTERS, B.A., Assistant Botanist (Transvaal).

I HAVE recently visited the farm of Mr. W. Woodhouse at Platrand, and find that the work done by him in establishing winter grasses is the best and most complete that I have seen in the Transvaal. It seems that the problem of establishing winter pastures has at last passed beyond the experimental stage as far as that part of the country and that particular type of soil are concerned; it is a sandy loam which retains moisture better than the heavier soils at Standerton.

Mr. Woodhouse has about 1200 acres (English) laid down to winter grasses. The bulk consists of *Paspalum dilatatum*, together with a few acres of *Paspalum virgatum*. The remainder is made up of 120 acres of tall fescue (*Festuca arundinacea*), New Zealand grown, 70 acres cocksfoot (*Dactylis glomerata*), about 4 acres of Toowoomba canary-grass (*Phalaris bulbosa*), and about 40 acres of a mixture of tall fescue, sheeps burnet, cowgrass-clover, cocksfoot, and a little sainfoin. Some of the tall fescue is five years old and the phalaris three years.

Mr. Woodhouse reports that these grasses kept green right through the winter, with the exception of the paspalum. The latter dies down in midwinter, and is most useful for the period immediately following the end of the veld grasses, as it keeps green till June and starts new growth about the end of August.

It is during the intervening period, between the beginning of June and end of August, that the winter grasses are so valuable. Mr. Woodhouse considers *Phalaris bulbosa* to be the best of these, and it is the price of the seed only which prevents him putting down a very large acreage of it. He finds that it spreads from self-sown seed, and there are hundreds of volunteer plants between the rows.

Tall fescue (*Festuca arundinacea*) is the next best grass, and spreads well if allowed to seed itself.

I consider that the best plot of all is the mixture of tall fescue, sheeps burnet, cowgrass-clover, cocksfoot, and sainfoin. The sainfoin plants are exceedingly promising, and the cocksfoot is also good. There is no pure stand of burnet.

Mr. Woodhouse has always found the best time for sowing to be in January and February. A neighbouring farmer has lost a large acreage of tall fescue by sowing it in November.

Citrus Fruits at the Johannesburg Show.

By R. A. DAVIS, Government Horticulturist (Transvaal).

Synopsis of a lecture delivered at the Maize and Citrus Show of the Witwatersrand Agricultural Society, Johannesburg, 27th July, 1910.

THE exhibition of fruits in this hall to-day is unmistakable evidence that South Africa is a citrus country. No other land can show a better selection of high class fruit than is to be seen on these tables—oranges, naartjes, lemons, grape fruit are all of the best. I am fully aware, however, that a much more representative lot of exhibits would have been present here to-day had it been possible to hold the show at a date which would better have suited the Natal growers. However, had more consideration been paid to them on this occasion those of the Cape Colony and the Transvaal would have not been able to make so good a display; and it is for that reason that I suggest in future that a show of a similar nature should be held in each Province annually. By adopting that plan each would in turn be able to select the date most suitable for their own requirements. I look upon the growing of citrus fruit as one of the most important of our budding industries, and I do not take a provincial, but a South African, view of the subject. What appears to me to be of the utmost importance is that even at the present time our production is more than equal to our consuming power, and that fact causes the question of the export of citrus fruits to at once assume a considerable amount of importance.

THE LESSON OF THE EXHIBITS.

Leaving that subject for a moment, let us turn to the exhibits and see if it is not possible to learn something from them. Take for instance this sample of oranges which I brought with me to this hall. To the experienced grower there is no need to say why they were not placed on exhibition.

Nor is it a hard matter to tell the history of the trees from which they came. I do not know the orchard, but though I have never seen it, I can give you a sketch of what it is like. It appears in my mind as one largely overgrown with weeds; it has had no attention; possibly the weeds are burned off annually by fire. It certainly gets very little cultivation and little or no water. There are dead patches of wood in many of the trees and a yellowish tinge to the leaves, which is an indication of trouble at the roots. It is safe to lay a wager that the orchard has seen no fertilizer for years, and the result is this miserable sample of fruit which you now see.

Take, on the other hand, this beautiful Washington Navel orange. It has only been produced by the exercise of the most careful attention to all the details of the modern rules of fruit culture. This fruit came from trees which have been pruned, which have been carefully tended, and which have had water when required. The

soil has been kept in a good state of tilth, and has had judicious fertilization; the result is what you see—a perfect specimen of its type.

Now, there can be no question as to the desirability of what kind of fruit to grow, and I strongly recommend those growers who allow their trees to become neglected to cut them down and plant mealies, or let some one have the place who will look after it properly. We don't want a lot of rubbish grown in South Africa for several reasons—one is that our own people are now educated and know what is the best, and that is what they will have; another is that we are going to take our place as competitors in the world's citrus market, and if we grow rubbish we can never obtain a good name nor secure a sound footing on that market.

THE INDUSTRY IN SOUTH AFRICA.

But, from the bulk of the exhibits shown here to-day, I am convinced that the South African orange grower is not going to take a back seat. He is a progressive man, and in time will take that place to which he is entitled as a supplier of the best citrus fruits in the world. For he can do it. No other country is quite as well situated as some parts of South Africa for the production of these fruits in all their variety. Take, for instance, the high upland districts in the Transvaal, Cape, and Natal Provinces. They present unrivalled facilities in their freedom from rain during the period when the fruit is ripening, thus rejoicing in an atmosphere so dry that the carrying qualities of the fruit is assured. The deep red soil of the foothills might have been specially prepared for the growth of the trees, and the question of a water supply is usually one which presents no insurmountable difficulties. In addition, the late development of our railways places the large majority of districts in direct communication with our large towns and the ports. As far as the growth of the fruit is concerned all the essentials for this export trade are at hand. Much remains to be done before it can attain large proportions, and between the time when the fruit is picked from the tree and is eaten in some European city there is a gulf which can only be bridged by the most careful attention to several details, the observation of which to the minutest degree is imperative.

THE JOURNEY OF AN ORANGE.

Let us follow an orange on part of its journey from the producer to the consumer. The fruit should be cut from the tree with a pair of orange clippers specially made for the purpose. They have rounded ends and no points, in order to prevent any possibility of injury to the skin. It should be placed carefully in a proper bag or receptacle carried by the picker, and not dropped in. Each orange should be handled as if it were an egg. The slightest bruise should be avoided. From the picker's bag they should be carefully placed in boxes and removed to the packing-house, where they remain for two or three days before being put through a grader, which sorts them out according to size. There are a certain number of recognized sizes for export, and they are as follows:—96, 112, 126, 150, 176, 200, 216. Of these, the favourite sizes are 126, 150, 176. As the fruit leaves the machine it drops into separate compartments, each size apart from the other.

PACKING.

It is then taken in hand by the packers and wrapped in thin, specially-prepared paper stamped with the name and address of the grower, and packed carefully in boxes. As each box is of one uniform standard size, measuring outside 26 × 12½ × 12½, it follows that the packing must be skilfully done. There is room for so many oranges of such and such a size in the box and no more, therefore each fruit must be packed in its right place. Packers should trim their nails so that the oranges may not be punctured in any way in handling. As the boxes are filled they are taken away and placed in a press which forces the fruit still more firmly together, and admits of strapping being placed round each end and the cover nailed on. Then they are marked with the name of the grower—number and variety of oranges on one end of the box and the address of the consignee on the other—and are ready for shipment per rail.

Many boxes of citrus fruits here to-day are well packed. The best work shown in the exhibition here is done at Rustenburg, in the Transvaal, with some from the Cape not far behind, but there is still a lot of inferior packing, indicating total lack of experience.

THE BEST EXHIBITS.

The best Washington Navel oranges on the show are from the Cape Province; the best seedling oranges, naartjes, and lemons from the Transvaal. Grape fruit is only in evidence by two exhibits, and I am sorry for this, because South African grape fruit is as good as any, and better than most. There is a large demand for this fruit at good prices in the oversea markets. A few sample shipments have been made from the Transvaal and sold at fair prices. The dealer to whom they were consigned said that they were the best he had ever tasted, but, owing to lack of size and a nice smooth yellow skin to which the markets are accustomed, they did not fetch the same price as inferior fruit from Jamaica, which had the size and appearance but not the quality. Later on a box of this same article from Jamaica was sent to me, and I found that the dealer's remarks were quite correct. I would not have eaten one of them, but as long as the market calls for that class of fruit there is every reason why it should be supplied with it, and in a very short time the Government Experimental Station at Warmbaths will have either trees or buds for distribution.

WHAT TO GROW.

On the whole, and keeping in mind the fact that we here in South Africa want to do a big export trade in oranges, and in fact all other fruits, we have to bear one or two points permanently in mind. The principal one is to produce the best possible fruit of the kinds the market demands, to produce them at the right time, and to get them to market quickly and in good condition. The kinds to grow are undoubtedly the Washington Navel principally amongst oranges, the Beauty, Glen Retreat, and Dancy's Tangerine amongst naartjes. Lemons are best left alone; we can't grow them to compete with Sicily, where they are satisfied with such prices as our farmers wouldn't look at. There are also good seedling oranges, such as form the bulk of the present Transvaal export, but they will not fetch prices such as the leading variety I have named.

THE QUESTION OF STOCK.

With reference to stock upon which to grow oranges, this is a much discussed and vexed question, and I am fully aware that in partially condemning the use of the rough lemon for that purpose I am going to evoke some unfavourable comment. I do not wholly condemn it, because of its extreme hardiness under certain circumstances such as a year of drought and also because the fruit of an orange tree budded on lemon roots for the first time does not seriously deteriorate, although the lemon flavour may be distinctly detected by any one with a clean mouth (by that I mean one who is perhaps a non-smoker). What I object to is the continued working on lemon roots of buds cut from trees already budded on lemon stocks. If this practice is continued for four or five generations the result is a loss of sugar and a great increase in the acidity of the fruit, together with a decided coarsening of the skin, which renders it less saleable. There is, in addition, a marked tendency on the part of oranges grown on such trees for the fruit to assume a decidedly lemon shape and to become elongated instead of round. The experienced eye can at once detect the influence of the lemon stock in oranges worked even for the first time on these roots.

Then the question crops up, "What kind of roots are we to use"? The answer is, "It all depends upon the grower". If he is a careful orchardist, who will irrigate his trees with judgment and not drown the roots, then he may use sweet orange stocks. If he is a bit casual in his work in the orchard he had better use the rough lemon, as it is far more resistant to collar rot. But an ideal root for the orange has yet to be found, and experiments are being made not only in other parts of the world but also at the Government Experimental Station at Warmbaths, from which it is hoped with some degree of confidence that successful results may be obtained.

BOXES FOR FRUIT.

Now in regard to the question as to export boxes. I might mention that the box in use at present at our Warmbaths station is made of clear white pine and imported from Norway. The dimensions (as previously given) require eight pieces $26 \times 5\frac{1}{2} \times \frac{3}{16}$; three pieces $12 \times 8 \times \frac{5}{8}$; three pieces $12 \times 4 \times \frac{5}{8}$; and two battens $12 \times 2 \times \frac{3}{8}$. These boxes cost approximately 6d. at any port in South Africa. Inland exporters suffer in that their expenses for railage bring the price up to considerably in excess of that which prevails at the coast. The whole of the boxes used in the export trade should be of one standard throughout South Africa. At present so many sizes are in use that great difficulty is experienced in stowing them in the steamer, and it may be expected, unless some efforts are immediately made to secure the adoption of uniformity in the packages, that the steamship companies will refuse to accept all consignments which they cannot pack away with the necessary economy of room.

Fruit Culture in Swaziland.

By R. A. DAVIS, Government Horticulturist.

IN June last the writer had the pleasure of making a short trip through this most interesting country, which has been well termed the California of South Africa. Through the hospitality and kindness of Mr. A. M. Miller, local Manager of the Swaziland Corporation, headquarters were established at that gentleman's house near Mbabane, and under his guidance a short journey was made as far as Bremersdorp, with detours embracing various places and objects of interest. A visit was also paid to "Loch Moy", until recently the experimental farm of the above-named corporation, but now unfortunately lost to the work for which it was originally established.

The country is only very sparsely settled, so that it was impossible to pay more than a very few visits to individual farms, but enough information was obtained—both from observation of the soil and particulars secured regarding the climate—to convince one that, as a fruit-producing country, Swaziland should certainly be seriously considered in the future development which may be expected to occur in the export fruit business. The drawback at present is the lack of communication. As soon as a railway has been established between Breyten and a point on the Portuguese frontier of the country there is every reason to anticipate a steady stream of settlers. The inducement is cheap and good land, with plenty of water, and an oversea market for all the oranges and mangoes which can be produced.

The advantages of being within easy distance of a port are immense, the saving on cost of transport to the coast should be considerable, and that of time alone is of the greatest importance. In addition there is the facility of obtaining farming implements, machinery, and fertilizers at a minimum cost for carriage. Naturally when the railway is built it will link up with that which has already been completed by the Portuguese as far as their frontier, and it is along this line of communication that the settlement of Swaziland will commence and gradually extend. Fortunately its route will lie largely through an open well-watered country, where the soil is in nearly all cases good and in some extremely rich, so that pioneers will not be confronted with the terrible task of clearing timber, which is frequently the case in Australia and Canada.

The climate is well suited for fruit production. Many varieties of oranges, naartjes, pines, bananas, and mangoes have been planted at the experimental farm near Bremersdorp, and they all appeared to have done well. Lack of care during the late war was inevitable, and the consequences disastrous, so that although the trees are still standing one can see that no work had been done until the war was over. Peaches, plums, and apricots—and even pears and apples—are also found in Bremersdorp, though the latter are altogether out of place. There is little doubt but that the best fruits to produce for

export are the mango and orange, and it is these which should receive the greatest attention. It is not possible from the writer's short experience of the country to say where each of these fruits will grow best and to give any definite localities, but, roughly speaking, mangoes can be planted wherever there is no frost, provided that the soil is fairly good, whilst the citrus family can stand just a little cooler climate. Near Bremersdorp there is ideal soil for the production of first-class mangoes, being a rich, deep, chocolate loam, whilst in the town itself some fine mango trees may be seen. These trees appear to be about 16 years old, and were probably imported from Natal. Neglected to a large extent, they stand to-day still bearing large crops annually, and pointing out mutely that, even under all the adverse circumstances to which they have been subjected, they are still healthy and doing their best to fulfil their mission. They are the pioneer mango trees in Swaziland. Pioneers often get hard knocks, but these trees are still showing that, notwithstanding all their sufferings, they can survive. The conclusion one is compelled to arrive at is that, given better conditions—such, for instance, as clean cultivation, a little pruning, a little water when needed, and plenty of room to grow in—the mango is the fruit tree par excellence to grow in these parts of Swaziland to which it is adapted. It may be as well to point out here that there are mangoes and mangoes, and some are scarcely worth the trouble of planting. The writer was unable to find out the names of the different varieties grown at Bremersdorp, but it cannot be too clearly pointed out that the fruit which is acceptable on the European markets should be grown, and that only. Experience gained in a trial shipment of this fruit last year, which was sent from Barberton, went to show that, out of some six kinds sent, there were two which sold much better than the others. These were the "peach" and the "sabre"—the former a fine mango with little fibre and good flavour, and of typical peach colour; the latter a fruit, sabre shaped, of a brilliant red, not as good quality and slightly stringy. Neither of these mangoes is in the very highest class, and it should be the aim of growers to secure the best possible varieties. Swaziland, with its nearness to a port, enjoys a great advantage over any other mango-producing district in South Africa, because within a few hours of picking it would be possible for the fruit to be snugly packed away in a cool chamber, thus ensuring perfect carrying.

Some citrus fruits were seen between Mbabane and Bremersdorp which quite confirmed the general opinion that trees of this nature would be a success. All citrus trees planted should be of varieties suitable for export. Local demand can only be of an extremely limited nature for some time to come, and may be treated as a negligible quantity. Unfortunately time did not permit of a visit to the one orange grove which is usually quoted as an example locally—that of Mr. Major on the Lebombo Flats—but from all reports it may be accepted that the fruit produced there is equal to the best Transvaal seedlings. The foothills of the mountains are admirably adapted as sites for orange orchards, and there is also an abundance of water, though this factor, so important in the high uplands of the interior, is really of less consequence in the more moisture-laden atmosphere of the Swazi valleys. There are innumerable sheltered kloofs and nooks which lend themselves naturally to the laying out of ideal orange

groves. The climate is all that can be desired, being somewhat warmer on the whole than that of the celebrated citrus districts of the Transvaal, and the expense attached to the culivation of the trees would probably be considerably lower than is the case in that Province owing to cheaper labour and less need of irrigation.

Naartjes and lemons thrive equally as well as the orange, but at present there are few good kinds in the country. Cultivation of these on a large scale is not recommended, the reason being that the naartje is not so fully appreciated in the oversea markets as it might be, whilst Sicily-grown lemons are produced in such immense quantities, and sold at such low prices, as to render competition out of the question.

Pineapples and bananas at "Loch Moy" appear to be quite at home. Indeed the latter is indigenous to Swaziland. It is found in the most inaccessible places growing with a luxuriance and wealth of foliage which need to be seen to be believed. There is no matter of doubt as to the success of its cultivation. It is problematical, however, whether large profits would be obtained, as the supplies of this fruit from Natal are large and the prices paid only moderate.

Many other fruits of a more or less tropical nature are successfully grown, and include avocado pears, litchis, jackfruit, custard apples, etc., the most important of which, from a commercial aspect, is the avocado pear, and this should receive attention at the hands of settlers. It is a fruit which has not hitherto received the attention it deserves. Undoubtedly in a few years time it will be largely grown and exported. Easily raised, and subject to but few pests, there is every prospect that the avocado pear will take its place amongst the standard classes of South African export fruit.

The question of fruit trees of a deciduous nature has not received much attention. A few gardens in Bremersdorp show that the owners take some interest in them. Apples, pears, plums, peaches, and apricots were seen, but largely of a type unsuited to the climate. Apples, for instance, although having a wider range than most fruits, are not at home at an altitude of but some 2000 feet above sea-level in latitude 26 to 27 degrees south of the Equator, in a climate somewhat resembling tropical. There are, however, plenty of varieties of peaches, pears, and plums which are entirely suitable for cultivation, and which should prove remunerative if grown for the early local and Transvaal markets. These embrace in peaches practically all those of Chinese origin and many of their hybrids, the best possibly being Jewel and Waldo. These varieties fruit early, and should ripen before any of the warmer Transvaal districts, thus ensuring the cream of the market. Plums of Japanese type should also succeed well, but the domesticated varieties would be quite useless. Pears having a Chinese origin are likely to succeed, such kinds as Keiffer, Garbers, and Le Conte being the most suitable.

To sum up, it may be said that Swaziland, when railway communication has become an accomplished fact, presents unique opportunities as a fruit-growing country. Land is cheap and good; water is plentiful; the climate in most parts quite healthy and fit for European habitation. Nearness to Lourenco Marques places it on a most favourable footing for an export business. All that is wanted is a white population in order to develop those resources with which nature has so bountifully endowed the country.

Breeds of Poultry.

By REGINALD BOURLAY, Government Poultry Expert (Transvaal).

ALTHOUGH we have already dealt with the subject in the *Transvaal Journal*, it was at a remote date, and as some of the back numbers are not available, and inquiries are continually being received as to the most suitable breed to keep in the Transvaal, the subject will probably be of interest to many readers.

It must be clearly understood that a great deal depends on the strain, for there are good and bad laying strains of nearly every breed; thus the following remarks must naturally be of a general nature.

It is not our intention to deal individually with every breed, but rather to set forth the good and bad points of those varieties which we consider to be best suited to the conditions existing in South Africa, and although the number may not be very great, yet there are quite sufficient to admit of a satisfactory selection being made.

To commence with the non-sitting breeds, i.e. breeds which have lost the maternal instinct and, consequently, do not as a rule become broody, although there are instances where birds of the non-sitting varieties have become broody and hatched and reared chickens, we have the Minorca, Leghorn, Ancona, Andalusian, Houdan, and Hamburg, and several other breeds which need not be mentioned.

The Minorca is bred in two varieties, the black and white. The latter is seldom seen and cannot be called a popular breed, whilst the Black Minorca is still very popular and in great demand partly owing to its beauty, and also to a great extent due to the large eggs that it lays. We are rather surprised that the popularity of this fowl has lasted so long, for we have found, from both personal experience and that of others, that the Black Minorca is a delicate bird and not too well suited to the variations of the Transvaal climate. If kept in a shady and sheltered spot it will, with proper attention, thrive and give very satisfactory results, but if compelled to rough it—as so many birds on South African farms have to do—it is apt to be a source of disappointment. Here we would like to remark that the Minorca is not the Black Spanish which was so popular some years ago. The Spanish, from all practical points of view, is extinct, and we doubt whether there are more than two or three pens of this breed to be found in South Africa, whilst in England it is seldom that any are seen.

Of Leghorns there are several varieties, some of which are little known in South Africa and need scarcely be mentioned. In popularity the White Leghorn undoubtedly takes the first place, and rightly so, for it is one of the most useful birds of this class that we have, being a prolific layer of a large egg, and is also a hardy, active bird. Of recent years there has been a tendency on the part of the breeders to increase its size both in body and length of leg, but it is a development which we view with considerable apprehension,

for it would be hard indeed to improve on the old type of Leghorn from the laying point of view, whereas we fear that if the present type is to become the fashion, the egg laying will suffer and the breed will lose that good name for hardiness and virility which it now possesses.

The Brown Leghorn is also a popular breed, but has not nearly so many friends as the former variety. It is still bred true to type, and there is not that tendency to increase the length of leg referred to above. As a layer it is decidedly good, but we consider that it fails to meet the requirements of a farmer's fowl in that it is not sufficiently hardy, and the eggs in many instances are small.

The Black Leghorn has, of recent years, been steadily gaining ground in this country, and whereas, four or five years ago, there were few specimens to be seen, at the present day there are numbers being bred and exhibited at the various shows. As a layer it is excellent, the eggs being large in proportion to the size of the bird. It is not a large fowl by any means, and when a Black and a White Leghorn of the present type are placed side by side it seems hard to imagine that they are both of the same breed. The Black is very hardy, active, and a good forager, the chief drawbacks being that, at present, many strains do not breed very true to colour, the tendency being to throw white feathers in the wings, tail, and hackle, and also to show dark and willowy legs instead of yellow, especially in the hens; but from the purely utility aspect these are minor defects so long as the egg average is up to the mark. This variety is rapidly ousting the Brown Leghorn in the race for second favourite amongst the numerous varieties of the Leghorn family, and will probably very soon be as popular as the White Leghorn.

There is also the Buff Leghorn, but it is not largely bred owing probably to the colour difficulty which is experienced with all Buff varieties.

All Leghorns should have pure yellow legs, though where the birds have been running on hard dry ground it is no uncommon thing to find that this yellow colour fades into a white, but this cannot be taken as an indication of impurity, as it is entirely due to lack of moisture, and chickens bred from such birds will still have correct leg colouring.

The Ancona, though not being taken up very strongly as an exhibition bird, is well worthy of notice. As a layer it is excellent, the eggs being of a good marketable size. It is very hardy and active, and is perhaps one of the best foragers that we have. By nature it is very shy, and will frequently rise in the air and take a fifty or one hundred yards flight on the appearance of strangers; but we consider that its activity is a great point in its favour, as, by taking so much exercise, it keeps itself in good health.

The poultry club standard has, of late years, insisted upon a mottled leg colour in Anconas, whereas previously either pure yellow or mottled legs were permitted. We think that a great deal of harm has been done to this breed by insisting on this mottling, for the Ancona cocks almost invariably had pure yellow legs, whereas 75 per cent. of the pullets had mottled legs, the remainder being yellow, but since the revision of the standard insisting on mottling in leg colour, many breeders have introduced foreign blood in order to attain this end, with the result that it is now very hard indeed to be sure that one is getting really pure stock.

The Andalusian is, strange to say, not a very popular fowl, the reason probably being due to the fact that, in breeding this variety, so many "sports", i.e. mismarked birds, are obtained. It is of a slaty blue colour, and is hardy, active, and a prolific layer of large eggs. Those who have kept this breed speak in glowing terms of its laying powers, but it is rather difficult to get a pen as there are so few breeders who stock it in South Africa.

The Houdan is not, in our opinion, a fowl which is suitable for farmers to keep in South Africa as a pure breed, owing to its heavy crest, but as an all-round fowl for crossing, either for eggs or table purposes, we consider it to be invaluable. In colour it is black and white, each feather being black, tipped with white. It has also a heavy crest, beard, and whiskers, but one of the most noteworthy characteristics is the possession of the fifth toe, which is only to be found in one other breed, namely, the Dorking, and also of course in breeds containing Dorking or Houdan blood, such as the Faverolles. The Houdan is by far the best of the non-sitting varieties for table purposes, having a white skin and flesh of extremely delicate and juicy nature.

Of Hamburgs there are several varieties, the Black being by far the most common, but this breed is seldom met with in this country for two reasons, firstly, because it is such a small bird, and, secondly, because it lays such small eggs that they are scarcely marketable. But although the egg is small, the number makes up for this deficiency, for the Hamburg undoubtedly is well to the fore as a layer.

All the above breeds, and, in fact, all the non-sitting varieties lay white-shelled eggs. They cannot be classified as table birds of any degree of excellence, for many of them when plucked are very skinny, but their great value is that of the egg producers, and it must be borne in mind that when only non-sitting breeds are kept, it is necessary to have an incubator or a few sitting fowls to carry on incubation and rearing of chickens.

The second class is known as the general purpose fowl, i.e. one combining the qualities to a greater or lesser extent of both laying and table birds.

In this class are included the Orpington, Wyandotte, Langshan, Plymouth Rock, Brahma, Cochin, and Faverolles, but of these the Brahma and Cochin can be ignored as being too heavy and lazy to ever be of any practical use in such a hot climate, and in countries where milder conditions reign, these two breeds are only occasionally used for crossing purposes or are otherwise kept for purely fancy purposes.

Of the numerous varieties of Orpingtons it is perhaps only necessary at the present time to consider the three most popular, namely, the Black, Buff, and White.

These breeds take their name from the village in Kent where that clever and enthusiastic poultry breeder, the late Mr. Cook, who made this breed, lived, but though they all bear the name of "Orpington", the various breeds used in evolving these different varieties vary very considerably.

The Black Orpington, which was the first to make its appearance, is a useful all-round bird. Many strains are extremely good layers, and, as a table bird, it takes a very prominent place. It is better suited to cooler situations than to warmer parts of the country, and

will stand cold better than heat, though where plenty of shade is available it will thrive even in the hottest places.

The Buff Orpington, which is undoubtedly the most popular variety in South Africa at the present time, is of rather a different type to that of the Black, being slightly longer on the leg and rather less "blocky" in appearance. Of this variety there are some very good and some very bad laying strains. It is a hardy bird, a good sitter and mother, and a table fowl of fair quality, but its great fault lies in the colour, which fades very rapidly if exposed to the sun. Further, there are invariably a large number of mismarked chickens obtained when breeding from even the best specimens, the usual faults being partially white and black feathers in the wing flights and tail, but birds bearing these defects are just as good for laying or crossing purposes (and sometimes better) as those which are correct in colouring.

In the minds of many people there is an idea that a Buff Orpington showing mismarked feathers is not pure, but a little practical experience in breeding this variety will soon correct that impression.

Until about four years ago there were very few White Orpingtons in South Africa, and for some unknown reason this breed was not extensively kept in other countries, though we remember seeing a very nice pen of these birds near London some sixteen years ago, but presumably the Buffs and Blacks had such a strong hold that poultry breeders could not spare time to think of another variety. Considering the short time that this breed has been kept in this country, it is wonderful how it has "caught on", and we think that it has a big future before it.

In type it more closely approaches that of the Black Orpington; it is hardy, a good layer and sitter, and makes a capital table fowl. We have frequently noticed that, when comparing eggs laid by pullets, those of the White Orpington pullets are far larger than those laid by the Buff Orpingtons of the same age.

It will not be long, we think, before the White Orpington displaces the Buff in South Africa, for if its popularity still continues at the present rate it will very shortly outnumber both of the other varieties at most of our poultry shows.

All Orpingtons should have clean legs free from any indication of feathering on the shank; in all varieties the legs should be white, excepting in the case of the Black Orpington, when the legs are black.

The Wyandotte is again a breed of which there are many varieties, amongst which we can number some of our finest layers. The principal varieties are the Silver laced, Golden laced, the White, and Black.

The Silver laced Wyandotte is probably the most beautiful of what may be termed our utility birds, for the even lacing in a good specimen is most striking in effect. As layers, the Silver Wyandottes are generally good, though by this we do not mean to infer that there are not inferior strains, for there are. The great fault to be found with this variety is that many of the eggs are rather small. As sitters and mothers they are good, being quiet and gentle, but we have noticed, especially in the case of Silvers, that no time is wasted after the chicks are old enough to be left, for they have a habit of

commencing to lay frequently when the chicks are only about two weeks old, and will leave them as soon as they are of sufficient age.

The White Wyandotte at present holds the premier position as a layer over all varieties of this breed and also in some of the laying competitions in various parts of the world over all other breeds. Not only is it the best layer amongst the Wyandottes, but the eggs are considerably larger than those of the other varieties, and are consequently more saleable. It is by far the most popular variety of the Wyandotte family both in this and other countries. A striking instance of this is afforded by glancing at the catalogue of the Dairy Show held in London last October, where there were fifty-eight entries in the class for White Wyandotte cockerels and sixty entries for the class of White Wyandotte pullets, against twenty-eight cockerels and thirty-seven pullets in the Black Wyandottes, which were the next strongest classes in this breed.

Of the Golden laced Wyandotte little need be said, as, from a utility point of view, the eggs are too small to make it worthy of consideration.

The Black is a comparatively new variety, but is subject to the usual faults of colouring common in all new black breeds, i.e. white feathers in wing flights and tail, and, in many cases, badly coloured legs.

Though I have not kept this variety, I am informed by those who have, that it is a good layer of a good sized egg, but owing to its recent introduction it has scarcely yet been sufficiently tested in that direction.

The Plymouth Rock is a fairly well-known bird, and here, again, there is a vast difference in the egg production of the various strains, many of which are decidedly good. There are three varieties, the Barred, the White, and the Buff, but the Barred Rock is undoubtedly the most popular and most often seen, though there are a few breeders of the White in South Africa. Also as a table fowl and for crossing purposes, it is extremely useful. Many strains are very good sitters, though on the other hand we have had some strains of Plymouth Rocks which very seldom became broody.

The Rock is a hardy breed, well suited to cold and exposed positions. It is a heavy eater, but this is only natural considering its size.

Langshans are not largely kept in South Africa, but it must be remembered that there are two distinct types of this breed, the one being a short-legged bird very similar in type to the Black Orpington of the present day, only with feathered legs, the other, which is most frequently seen at the present time in the show-pen, being very long in the leg and narrow in body. This latter can hardly be considered as a farmer's fowl as, owing to its great length of leg, the chicks are subject to leg weakness, and the former type is so similar to the Black Orpington that its place has practically been taken by this breed.

The Faverolles is a breed well deserving a place in the list of our utility poultry. It was made by crossing the Brahma, Houdan, and Dorking, and shows to a certain extent the characteristics of all these breeds, having the beard and whiskers of the Houdan, the feathered leg of the Brahma, and the white leg and five toes of the Dorking. It is hardy, a good layer, and a capital table fowl, which

one would naturally expect in a bird containing both Houdan and Dorking blood. We had a pen of this breed in Potchefstroom in 1903, and found that they did remarkably well, but they did not meet with the approval of the poultry-keeper, the reason generally given being that they were too much like a Kaffir fowl, though we must say that we have never seen a Kaffir fowl which approached anywhere near a Faverolles in size or could compare with it as an egg producer or table bird.

The third classification consists of table birds, i.e. those which are best suited for consumption. In this list many of those already mentioned may be included, such as the Houdan, Orpington, Wyandotte, Faverolles, and Plymouth Rock, but none of these can be compared with the Game or Dorking. Unfortunately the Dorking does not appear to thrive in most parts of South Africa. We have tried it ourselves, as have many others, but without success, and this valuable breed must consequently be eliminated from the list.

The Indian Game, sometimes called the Cornish Game, is the next in importance. This breed is rather deceptive in appearance owing to its tightness of feather, which gives the impression of immaturity and lack of size, but this idea is quickly dispelled when the bird is handled. The Indian Game has the reputation of carrying more breast meat than any other breed, and rightly so. It is a capital table bird but a very indifferent layer, but for crossing purposes, where it is desired to improve the quality of poultry for consumption, it cannot be beaten.

The Old English Game is also a valuable table fowl, not so large as the Indian Game, yet the quality of the flesh is far superior, being very delicate in flavour. In some places its pugnacity prevents its being kept, for, having been bred up to fighting for generations it is impossible to keep another rooster within reach of an Old English Game cock, though possibly this hint may be of value to those who are worried by visits from their neighbour's roosters.

Results of Laying Records of Various Breeds of Poultry at Government Experimental Farm, Potchefstroom.

By REGINALD BOURLAY, Government Poultry Expert.

THE following records will probably be of interest to poultry breeders in the Transvaal who have during the past few years procured eggs and poultry from the Government Experimental Farm at Potchefstroom:—

RESULTS OF LAYING OF VARIOUS PENS OF POULTRY, EXPERIMENTAL FARM, POTCHEFSTROOM.

8TH MAY, 1910, TO 6TH OCTOBER, 1910 (INCLUSIVE).

No.	Breed.	No. of Birds in Pen.	Eggs Laid.	Notes.
1	White Wyandottes	3	234	A
2	Buff Orpingtons	4	269	A B
3	Anconas	5	317	A
4	Minorcas	6	381	C
5	Black Leghorns	10	620	C
6	Silver Wyandottes	8	500	C
7	White Leghorns	7	413	C
8	White Orpingtons...	9	507	C
9	Plymouth Rocks	4	221	A D
10	White Leghorns	9	485	C
11	Buff Orpingtons	8	427	C E
12	White Leghorns	8	424	C
13	Silver Wyandottes	7	362	H
14	Black Leghorns	10	510	H
15	White Wyandottes	7	356	A
16	White Wyandottes	7	349	C
17	White Wyandottes	7	345	C
18	White Leghorns	7	341	H
19	Brown Leghorns	8	383	C K
20	White Orpingtons...	6	291	H
21	White Wyandottes	7	332	H
22	Indian Game	7	332	C
23	White Leghorns	3	141	A M
24	Anconas	8	351	H
25	White Orpingtons...	7	302	A P
26	White Wyandottes	8	326	H
27	Buff Orpingtons	8	318	H S
28	Old English Game	7	260	A
29	Minorcas	6	214	H
30	Indian Game	8	264	H

A—Indicates imported. B—The breeder of these birds informs me that his own birds averaged 68 per head from 1st October, 1909, to 28th February, 1910. C—Young stock bred on farm. D—One bird died 12th September. E—One bird died 26th September. H—Birds in second season. K—One bird died 28th September. M—These birds scarcely laid at all during the first eleven weeks of the period, but were laying well before and after the period in question. S—One bird died 22nd September. P—Two birds killed in storm 22nd September.

It must be clearly understood that this was not a laying competition, but, as far as we know, the records are absolutely correct, for every care was exercised to attain this end.

The birds were not trap-nested, neither were the eggs weighed, owing to the impossibility of conducting this on a satisfactory basis with the present staff.

The different pens did not consist of the same number of birds in every instance as they were breeding pens and were all mated up for breeding purposes.

It will be noticed that the results compare very favourably with those obtained at the laying competition at present being held under the auspices of the Western Province Agricultural Society at Capetown, in spite of the fact that these birds are all on the one farm and are not the selection of a few hens of the best laying strains from many yards covering a large area.

In some instances it is true that some of the birds were imported direct from England only last year, but in some cases these imported birds do not show such good results during the period under review, as they were laying heavily both before and after the time of which records are given and were resting for part of the time during which the records were kept.

Poultry Farming in South Africa.

By R. BOURLAY, Government Poultry Expert (Transvaal).

A GREAT deal has been written relating to the status of poultry farming in South Africa, and many of the writers seem to be of opinion that this important branch of agriculture is not advancing in its due ratio compared with the other lines of agriculture, the usual argument being that we are still importing eggs and poultry; but the writers quite overlook the fact that the correct explanation will be found to be that the demand for poultry and eggs has increased enormously. The population in the mining areas and in the majority of towns is increasing faster than in the rural districts, and these will always be our markets.

Comparatively few fowls and eggs are eaten on the farms themselves, the majority are sold for consumption in the towns, and as our mining areas increase and manufactures and industries spring up, towns and villages will follow, and to these hives of industry we must be prepared to supply what must be, in the natural order of things, an ever-increasing demand.

As already indicated, an increase in the imports of poultry and eggs may not mean a decrease in local production, it may indicate an increased demand with a corresponding increase in production taking place, but this state of affairs should not make us despondent but should be an incentive to further effort and an assurance that a paying margin will be maintained.

It will probably be news to such writers that poultry keeping is advancing steadily throughout the country, but in spite of such an advance there is yet ample scope for further production with advantage not only to the producer but to the consumer also. This advance cannot be noted by attending a few poultry shows, but it is not in this direction that the progress is shown, it is the farming community (the majority of whom would never bother to show their poultry) who are realizing the value of poultry keeping as an asset, and it is to this source that we must look for the supplying of our markets with what is required, for, through force of circumstances, the town-dweller is usually more or less handicapped owing to lack of space and being compelled to purchase his foodstuffs through the corn merchants, does not find that he is able to make egg-production a sufficiently large and consequently profitable undertaking. Thus his operations are confined to either keeping a sufficient number of poultry to supply his house with eggs, etc., or he keeps a pen of pure-bred birds and makes a little pocket-money by the selling of pure-bred stock and sittings, and thus helps forward the movement to the advantage of himself and others.

Although it is being realized by farmers in many parts of South Africa that poultry, if properly cared for, will yield a good return, yet there is plenty of scope for extension. No one has such good

opportunities for poultry keeping as the farmer, for he has the land and is able to grow most of the food required for the fowls, with the result that his expenses in this direction are not so great as those of individuals living in a town. But before he can make his poultry a paying concern, he must first make up his mind to give them their fair share of attention, a little forethought, cleanliness, observation, and application of common sense, and, may we add, a strict account of all his incomings and outgoings are all that is required, and, given anything like ordinary luck, he will find that his poultry are by no means the least profitable part of his farming operations.

It would be interesting to know what is the average monthly profit made by some of the farmers who go in for egg-production on a large scale, for one dairyman in Johannesburg informed me last May that he was paying a farmer from £20 to £25 per month for eggs alone. This, of course, would not all be profit, but £10 to £15 could, after allowing for all expenses, be counted as net gain, and this would be quite a low estimate.

I do not infer that every farmer is in a position to keep poultry on such an extensive scale as this, but, with a few exceptions, every occupier of land could make considerably more out of his poultry than he does at the present day, provided that he is willing to expend a little capital on a pen of birds for breeding purposes, which should be of some recognized laying strain with which to form the nucleus of his flock.

A very sensible letter dealing with the subject appeared in the *Cape Agricultural Journal* for October, 1910, written by the Hon. Mrs. Scott, of Devon, who is a farmer's wife herself, and we would strongly recommend any farmers who have any doubts as to the profitable side of poultry on a farm to procure a copy and study it carefully.

The main obstacle to profitable poultry keeping, i.e. the question of the market, which has to be overcome in so many countries, does not at the present time worry us in South Africa, for we have in our midst a splendid market which is ready and anxious to take all that we can supply. The railway rates on eggs are by no means prohibitive, in fact we consider that they are quite reasonable, and the system of railway extension which has been carried out during the past few years has brought most of the outlying districts in touch with the consuming centres. It must be borne in mind that eggs are a very perishable commodity; they cannot be kept without detriment a few weeks until the price rises or until some one happens to go to the station, but should be marketed in as fresh a state as possible. If permissible, they should be dispatched every day, as in the case of milk, but under no conditions whatsoever should they be allowed to accumulate for more than three days.

To command the highest prices, the article must be of the best quality, and this applies to eggs just as much as to meat, butter, milk, etc., consequently all eggs should be carefully collected every day, for consumers do not consider that they are getting extra value if they find a partially developed chicken in their breakfast egg. Those that have become soiled should be carefully washed in clean water and dried with a clean cloth, and neatly packed for market in one of the many boxes made for the purpose. If straw is used for packing

it must be clean and dry, for eggs are as readily tainted as milk and butter, and if brought into contact with anything which has a distinctive odour, they will absorb the taint through the pores of the shell and thus be spoiled for consumption.

It should be the aim of all who supply eggs for table use to get as good a supply as possible during the scarce season, that is from January to June, for it is during this period that the best prices are obtained, and in spite of all that has been said and written on this question, we maintain that it is possible to get a fair supply of eggs during the scarce season. The number will naturally be smaller than during the spring months, but eggs produced during this period pay, and pay well. This can be accomplished to a great extent by early hatching. Pullets hatched in May and June will generally be in lay by October or November, and, having finished their first batch of small eggs by Christmas, will come on to lay again shortly, and if fed judiciously will produce quite a lot of eggs at the time when they are most required.

In many countries producers have a plan of stamping their eggs with a rubber stamp in order that the purchasers may know whose eggs they are buying. This is a very good method to adopt when one is taking every precaution to ensure that absolutely fresh and clean eggs are sent to the market, for the brand soon becomes known, and when buyers find that eggs bearing a certain brand are always to be relied upon, a certain amount of competition is created, with the result that they command better prices. Compulsory branding might be a good thing, for then one would soon learn to avoid those marks which were not to be relied upon.

There is quite as much room for improvement in table poultry as in eggs—possibly more—for the class of fowl which one generally sees offered for sale on the markets in both large and small towns in South Africa is, with a few exceptions, anything but a suitable bird for the purpose, and no one can be surprised that the prices quoted in market reports are low, for 1s. 6d. to 2s, 6d. cannot be considered a very high price. But one cannot expect more for scraggy chickens or old hens which have seen their best days, and which are packed so closely in crates, in which they may have been confined for three or four days, that they cannot move about without treading on one another. Under these conditions they naturally do not show to advantage, and one could not expect birds of good quality to realize their proper value under like conditions. Further, the crates in which the birds are forwarded seldom appear to be clean, which helps to account for the overpowering smell which so often pervades the poultry section of the morning markets in some of the larger towns, which is quite enough to keep away buyers who require and are willing to pay for a good article, for, with a combination of odours and diseased birds, filthy crates, and a few dead fowls, we have frequently been compelled to forego the interest of watching the selling of poultry in some of our larger towns.

The practice of sending diseased birds to the market should also be repressed, for it is no uncommon thing for farmers, when they find that their birds are dying, to send the remainder to be sold on the market, on the principle that it is better to get a few shillings for what they have left than to lose them all by disease.

It is the duty of the market authorities to see into this matter so far as it lies within their power, but a great deal also lies with the producer or the hawker who collects and forwards these birds, for it is a common habit amongst such to have a fowl-run into which the birds are put as they are collected from time to time and kept until there are enough to make a consignment. These runs and houses are seldom cleaned, and diseased birds are mixed up with the healthy ones, with the result that all are liable to contagion. This practice would soon cease if the municipal authorities would pass a law absolutely prohibiting the sale of diseased birds on the markets and enforce it rigidly, and the railway authorities could materially assist by strictly enforcing their present regulations relating to overcrowded and dirty crates. And when these faults are remedied, it is up to the farmer to produce a better article, for it costs no more to rear a good bird than a bad one, whilst the difference in return is not to be compared.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

THE DIVINING-ROD AND WATER-FINDERS.

To the EDITOR, *Agricultural Journal.*

Sir,—Having read Sir Ray Lankester's (K.C.B., F.R.S.) definition of the above in the last issue of the *Cape Journal,* I beg to draw that gentleman's attention to his argument where he makes mention of the action of the divining-rod being due to the fatiguing of the muscles and their sudden unconscious relaxation. Now, being an occult art, that is to say, hidden and untested, what authority does he base his principle on ?

The theory that divining for water requires a proper knowledge of geology is a fallacy, as this is thoroughly proved to the contrary by blindfolding the operator. The same holds good with regard to fatigue, etc., as water once indicated can be located at the exact spot blindfolded as accurately as if the diviner had the faculty of both his eyes, no matter what distance the operator started from, which goes to prove that the fatiguing of muscles, etc., is out of the question. I admit that a diviner (not a humbug) to be successful requires the knowledge of being able to define the difference between water and minerals, as he is apt in his ignorance to be led astray, with the result that what Sir Ray Lankester refers to often occurs, but through no fault of the diviner, as in his ignorance to manipulate the wand as a water-finder he invariably connects minerals with water.—Yours, etc.,

H. L. DUGMORE.

P.O. Glencairn, via Cathcart, 9th January, 1911.

SHORN RAMS AND BREEDING.

To the EDITOR, *Agricultural Journal.*

Sir,—Three and a half years ago when I came here I had twelve rams running in a neighbour's camp. Having to go to Victoria West on business I asked him to dip my rams and put them with my sheep as they passed. On arriving home I found my rams scabby, so I immediately shore and dipped them. They were tupping on the road, and on arrival I put them apart from the ewes but they would not stay away, so I castrated four and left them all with the flock. In October I got nearly three hundred lambs from eight rams, so I feel I can say that's proof enough that shearing does not interfere with breeding.—Yours, etc.,

AUSTEN JACKSON.

Canariefontein, Carnarvon District, 2nd January, 1911.

PROLIFIC FARM STOCK.

To the EDITOR, *Agricultural Journal.*

Sir,—In answer to Mr. E. W. Fincham's letter of 15th September, 1910, *re* goat ewe giving birth to four kids, which appeared in the *Cape Journal,* I beg to state we have a flock of about 250 boer goats, and almost every season have one with four kids. On one occasion we also had one with four ewe kids. We have one at present with four kids, which are all doing well.

It may also be interesting to the readers of the *Agricultural Journal* to know that one of our neighbours had a goat which gave birth to six kids.

Since writing the above, father tells me of an instance of prolificness in a cow giving birth to four calves, and it will no doubt be interesting to your readers. The calves were perfect, but all died within a few weeks. My father thinks he holds the record for this, and would like to know if any of your readers could give an instance of the same kind.—Yours, etc.,

R. G. LLOYD.

Lebanon, Alice, 6th January, 1911.

To the EDITOR, *Agricultural Journal.*

I notice the letter by E. W. Fincham in your December issue about a fruitful boer goat ewe. I also had one which the first year gave birth to one kid, the second year to six (all of which died), the next year again six (of which two died during the cold weather and one died of bloedpens). The next year she gave birth to four (of which two died of bloedpens), and the last year she gave birth to three, all of which lived, and I have one left, the image of the mother. Thus in five years I got twenty kids from one ewe. I sold the mother three years ago.—Yours, etc.,

ANDRIES VENTER.

Knoffelfontein, Philipstown.

To the EDITOR, *Agricultural Journal.*

Sir,—As Mr. Fincham (in the last *Cape Journal*) would like to know if any of your readers can give other instances of the prolific boer goat, I may state that some years ago when assisting on the farm Zoetendals Vlei, in the Bredasdorp District, and superintending the kidding, a rather small boer goat was delivered of five kids, but cannot now remember the sexes, and have frequently heard of similar occurrences.—Yours, etc.,

T. C. VAN BREDA.

Riebeek View, Malmesbury, 11th January, 1911.

FARMERS AND FARMING IN SOUTH AFRICA.

To the EDITOR, *Agricultural Journal.*

Sir,—I have read with considerable interest the articles in the November number of the *Cape Journal* on the cultivation of the sugar beet, dry farming, and also the letter from Mr. Philip H. Wedderburn. I mention the three as I consider they are in a measure connected.

What Mr. Wedderburn says of Canada applies equally to Australia, where I have resided for some years. The governments of those countries do all in their power to settle the poor man on the land, the man who will work himself and not have an army of Kaffirs doing it for him. They let him have the land on easy terms and assist him in all ways they can. If he improves the holding he is doing it for himself, and not for a landlord.

In regard to dry farming, the majority of the Australian selections are dry farms—that is, without irrigation—and it is seldom that a spring or fountain is found on them, the water being conserved in dams for the stock. The men who follow mixed farming seem to make a good living, and pay for their selections. But they do the work themselves and get the most they can from their land and stock.

Look at the difference in this country. If a white man has little money he can do nothing. He cannot get land unless he rents it from a landholder, who wants an exorbitant rent for land that he is making no use of, and he will probably get a lease that is just long enough to improve it for the benefit of the landlord.

There are thousands of morgen of land in this country that are held by men who do little or nothing with it. A very small portion is cultivated, and very often that is done by Kaffirs on the half system, just scraped over and a little forage or a few mealies grown, or a few wagon loads of wood cut.

Is this the sort of farming that will make an agricultural country or put her in a position to compete with Canada or Australia?—countries that do not despise the man of small means but welcome him and assist him, and in return he has made the countries what they are. On the one hand you have the man with thousands of morgen that does nothing; on the other hand the man with a few hundred acres who works it and produces for the good of the country.

If there was a working population on the land and there was a market for the beet, there is no doubt but that both beet and flax would be grown in sufficient quantities to establish an industry in the country.

Let the Government of South Africa do the same as other countries have done, and assist the poorer white population to settle on the land. Then there will be a likelihood of South Africa coming to the front in agricultural production.—Yours, etc.,

AGRICULTURE.

Port Elizabeth, 20th December, 1910.

LEAKAGES IN EARTHEN DAMS.

To the EDITOR, *Agricultural Journal.*

Sir,—Having seen in the last issue of the *Cape Journal* asking information whether ashes would stop water filtering away in a dam, I can say I have experienced it myself in a dam that has a gravelly bottom. I find that a moderate quantity of sand will prevent it filtering; it gets into the pores and thereby stops wastage. I can also inform Mr. Adams that I have never tried ashes. A good-sized dam would take about five or six wagon loads of sand. It must not be earth, only sand. I would advise Mr. Adams, of Kimberley, to give this a trial.—Yours, etc.,

J. T. JAKINS.

Riverside, Stutterheim, 12th December, 1910.

JACKAL POISONING.—A NEW DODGE.

To the EDITOR, *Agricultural Journal.*

Sir,—The sly jackal is undoubtedly one of the most difficult creatures to catch and exterminate, and one of the sheep farmers' greatest enemies. What a boon to farmers it would be if there were no jackals, and sheep could run undisturbed in their paddocks both day and night! A farm could certainly carry half as many sheep again as it does at present, and there would be a good chance of total eradication of scab. Jackals and scab are the scourge of the farmers in this country. I have spared neither pains nor expense to kill the brutes, and have succeeded in destroying a good many by poison. But the best method to deal with them I am now going to communicate to my fellow sheep-farmers, and should they adopt my plan it will soon be all over with Mr. Jackal. When the brute has caught a sheep or a lamb, catch a hare and place your poison inside it in three or four spots. Put the hare in the very spot where the sheep was caught, and if possible remove the sheep. The jackal is in the habit of visiting the spot within the first three nights, and the dead hare will not be left even should it cost the brute's life. Being a sly fellow, and so as not to awake suspicion, I place the hare, if possible, in an upright position at night-time.—Yours, etc.,

ENEMY OF JACKALS.

Olivenfontein, 4th December, 1910.

THE CROSSING OF SHEEP.

To the EDITOR, *Agricultural Journal.*

Sir,—In the *Cape Agricultural Journal* for December last, Mr. H. J. Steyn, of Rhodes, asks for some information about cross-breeding, and he mentions, amongst other varieties, the Shropshire breed.

It may interest Mr. Steyn to learn what my experience has been. Some years ago I purchased a valuable Shropshire ram and crossed same with merino ewes. I found the lambs to be strong and hardy. The outcome of the experiment was not at all satisfactory. In the first place the fleece from this cross is so light that, notwithstanding the slightly higher price obtained, it gives nothing like the return from merino sheep.

Secondly, I found it most difficult to herd this variety, as they are always on the move, and although it may not appear credible they get through well strained and laced barbed wire fences (7 wires, 4 feet 6in. high) with ease; even a stone wall presents no great difficulty to them. Owing to the small quantity of grease in their wool I am afraid they would not prove hardy in a wet climate. I may add that the carcass is fairly large, and under suitable climatic conditions they may pay a farmer who breeds for the butcher only. But to breed this class for wool-producing purposes is to my mind the greatest mistake a farmer can make.

I trust that your invitation to discuss the important points raised in Mr. Steyn's letter will be widely availed of.

Should Mr. Steyn care to try a few sheep of this variety on his property I should be very pleased to let him have some.

J. E. CONTAT.

Contat, 16th January, 1911.

BLACK ROT IN CITRUS FRUITS.

To the EDITOR, *Agricultural Journal.*

Sir,—I notice in a recent report upon the condition in which citrus fruit from Rustenburg arrived in London that there was loss due to Natal black rot, a fungus disease which I understand was until very recently confined almost entirely to Natal. It seems more than likely that this particular fungus has been carried to Rustenburg in the second-hand boxes, baskets, or sacks, commonly used by growers for carrying their fruit to Johannesburg or other local markets. Although I may be wrong in this belief it cannot be denied that the practice of bringing second-hand baskets, boxes, and sacks into the orchards and packing-houses of the district is of grave danger to the industry, and it would appear to be the duty of the Government to reduce this danger as far as possible.

The very heavy railway rates upon box-wood from Natal and the coast almost prohibit the use of new boxes for carrying the seedling oranges to the local markets, and unless these rates can be very considerably reduced farmers will continue to use second-hand packages.

If these conditions cannot be altered the responsibility of the probable introduction of all South African citrus pests and diseases into the Transvaal must rest with the Government, through their railways. They can hardly fail to recognize that these heavy railway rates are crippling two otherwise promising industries—box-making in Natal and fruit in the Transvaal. For the protection of the latter I would suggest that until some better solution of the difficulty can be found the railway authorities should undertake to disinfect all second-hand fruit boxes, baskets, and sacks at the stations from which they are sent, by dipping them in a solution of formalin and water, or something of a similar nature.

Personally I should like to see this matter brought forward in every paper in the Transvaal in order to bring the gravity of the situation to the notice of all growers.

When the fruit was carried in ox-wagons to the local market packages were seldom or never used, so that this is a comparatively new danger which has not yet been fully realized.—Yours, etc.,

G. S. JOHNSTONE.

The Honingshaw, Rustenburg.

THE BUILDING OF STAUNCH DAMS.

To the EDITOR, *Agricultural Journal.*

Sir,—Mr. A. W. Adams is inquiring in the November issue of the *Cape Journal* whether he can by spreading ash on the floor of his dam make it waterproof, as at the present moment all the water soaks away.

Ash will help, but no better than the mud which is naturally drained from the water. The cause of water soaking away depends largely on the manner a dam is made. A dam built in a kloof or ravine must be built from the lower side, and not from the top as is the old style. First make a trench where the dam wall is to come, so as to be able to close up all the mice holes. Make your dam wall slanting on both sides, as it is easier to get the soil on the top of the wall and your stock

will be able to get to the water at the wall whether the dam is full or not. Make your side walls also slanting so that the mud can settle down on the whole floor of the dam, because if the walls are perpendicular all the muddy water will be at the wall and the clean water on the sides. Such a dam costs much less, it is easier to clean, and can always be enlarged.

A dam made on level ground must be made slanting all round, so that stock can drink all round the dam, thereby the whole wall will be well tramped down, and the harder the better. You will notice that a road running through a loose bit of country will always hold water, whereas outside the road the water soon sinks into the ground. A macadamized road containing a crack will soon close up after a little use.

The wall of a dam which has no natural inlet for water should be made slanting like the roof of a flat house, so as to catch water.

Make the wall in comparison with the size of the dam, say 200 or 300 feet, erect two or three fencing wires, the one point at the dam to be level with the ground, the furthest point to be 4 feet high, and in a heavy rainfall such a dam will probably be filled, and the water will be much purer than that of a dam made in a ravine.

Where it is necessary clean drinking water can be procured from such a dam if you fence it in with netting wire.—Yours, etc.,

N. A. BLANCKENBURG.

Rodekleigat, Malmesbury.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

TIME TO CASTRATE.

Will you kindly give me advice on the following :—

1. Is any advantage gained by leaving a stallion till he is three years old before castrating ? What age is better, two, or three ?

2. Which is the better mule ? From a stallion and a donkey mare, or from a jack and a mare ? I am informed that by breeding from donkey mares a much larged mule is procured. Is that so ?—T. L. MINSTER, Wakkerstroom.

Answer.—1. There is no hard and fast rule as to the age at which a colt should be castrated ; everything depends upon the state of development of the animal ; well-fed and well-grown colts are best done as yearlings, but backward animals may be let run until they are two years old, and only in rare cases should the operation be deferred until they are three years old.

2. By far the more valuable hybrid is that from the jack donkey and mare horse ; it is much larger than the one from a stallion horse and donkey mare.—J. M. CHRISTY, Assistant Principal Veterinary Surgeon.

SCOUR IN CALVES.

I am having quite a lot of trouble with scour in calves. What is the best thing to give them, and how should they be treated ?—A. B. ANDERSON, Kaffirskraal, P.O. Standerton.

Answer.—The most rational line of treatment to follow in case of diarrhoea in calves is :—

First administer a mild laxative such as castor oil, 2 or 3 ozs., or epsom salts, 2 or 4 ozs., with a dessertspoonful of ground ginger, and following this in about eight hours' time by occasional doses of an astringent mixture such as that for which I enclose a prescription, or as an alternative instead of giving the laxative and then the mixture, you may administer a tablespoonful of Gregory's Powder mixed in a little water ; this has first a laxative and then an astringent effect. Care should also be taken about dieting calves suffering from diarrhoea. Their allowance of milk should be restricted for a day or two, and they should be given about half a pint of lime water each morning for a few days before they are allowed to suck. It is always dsirable to remove them and to disinfect the enclosure in which they have been kept.—C. E. GRAY, Principal Veterinary Surgeon.

SICK COW.

I have lost several valuable dairy cows recently from one cause and another. Another exceptionally good one is on the sick list now, and I shall be very glad if you can suggest a treatment. She is about eleven years old, has had seven calves, and is now about two months off calving. She is a hearty, lusty animal, and in fairly good condition. On the 11th my herd reported that she had grazed all right, but seemed weak. At 6 p.m. I gave her 60 grains calomel, and at 8 p.m. 1 lb. epsom salts, 1 lb. syrup (black Natal), and ½ lb. lard, in tepid water; this acted all right and her manure is normal. On the 12th she grazed very badly, and next day would neither feed nor drink; so, thinking that perhaps her kidneys were out of order, I gave her 1 small bottle (6d.) malt essence, and 1 small bottle (1s.) pain killer at 7 p.m. (the 13th). Next morning her bladder was relieved (water all right in colour, but smelt as if it had been retained too long) and the manure was still in good order. Her nose is rather dirty—but moist periodically—and her coat somewhat "starchy"; she appears to be free from pain, but refuses all food and water, and shows no inclination to leave the stable; temperature apparently normal and no signs of inflammation. When I first dosed her (the 11th) she was trembling in the flanks, but this has ceased. I am puzzled, and shall feel extremely obliged if you can advise me what to do.—R. THOMPSON, Box 125, Krugersdorp.

Answer.—I may say I am inclined to think your cow's present condition may be due to one of three causes; either something has happened to the calf and she is about to abort, or she has swallowed a foreign body, such as a piece of wire, and the foreign body has got into such a position that it is seriously affecting her health and may ultimately cause her death; or she is passing through a mild attack of redwater.

If it be the latter, the treatment to which she has been subjected is appropriate, and she may recover with careful dieting and the administration of nutritives, such as gruel, etc.

If it is the calf that is wrong, she may come all right after she aborts if her strength is kept up; but if her indisposition is due to the presence of a foreign body, nothing can be done to ameliorate her condition.

I am afraid a reply like this, giving you the choice of three evils, can hardly be considered very satisfactory, but it is the best I can do, unless you can furnish me with further particulars. I should like to hear again from you how the animal gets on.—C. E. GRAY, Principal Veterinary Surgeon.

MILK AND CREAM.

Will you kindly let me know at your earliest convenience what the right temperature milk should be when it is put into the separator, and also what is the thickness cream should be when sent to the creamery.

Is there any means by which I can ascertain about what quantity of butter fat is contained in the cream I send away, as a means of checking the figures returned by the creamery?—H. D. KEYTER, Driefontein, P.O. Kinross Station.

Answer.—The best temperature for separating milk is the temperature it has when it comes from the udder. The best plan is to separate the milk at once after milking, with as little loss of time as possible.

For the best quality butter cream should never exceed the thickness of 30 per cent. of butter fat, but the creameries in South Africa rather want the cream as thick as you can make it. Should it be too rich for churning then they can always dilute it first. I know of cream being sent to creameries testing 60 per cent. of butter fat.

I am attaching a bulletin, "Some Milk and Butter Tests". Another bulletin dealing with the fat percentage of cream and how to test it, entitled "How much butter fat does the cream contain?" is in course of preparation and will be published as soon as possible.—R. PAPE, Superintendent of Dairying.

RE ABORTION IN CATTLE.

I am very much obliged for your prompt reply to my inquiry *re* sick cow. I am glad to say she is much better. The day after I wrote you the milk veins became distended, and where they join the udder a number of knobs appeared (right side only) which, when touched, caused pain; so I concluded that something had gone wrong with the calf. We kept forcing her to take milk, with a little boiled whole linseed; and on Thursday, 8 a.m., we gave her about one-third of a tumbler of Cape dop, in tepid water. Strange to say, she started feeding within half an hour, and grazed more or less all day. Friday and Saturday she grazed well and took food greedily—to-day she seems quite well. Her udder has started to come out and the other swelling has practically disappeared. There was no sign of threatening abortion, so I cannot yet understand what was wrong.

One of my cows has a weakness for this, yet I believe she has the finest constitution in the herd. Several of my cows have aborted this winter. I attributed it to the exceptional severity of the season, but it has been suggested to me that possibly the cow with the weakness has influenced the others through the bull. The bull was sold yesterday, and the suggestion has set me wondering whether it would not be advisable to clear the cow out also, before another bull is bought. She is in calf (one month) now. What is your opinion?

Perhaps you will be so good as to give a prescription for sore teats in cows in the next issue of the *Journal*. This is a bugbear to me, having tried no end of things, more or less unsatisfactory. Zam-Buk I have found about the best so far, but it runs to nearly sixpence a dip with the confounded niggers using it.—R. THOMPSON, Box 125, Krugersdorp.

Answer.—I am glad to note that the animal now appears to be on the road to recovery.

I note you ask in your letter for some information about abortion, and as it would be rather difficult for me to dwell at length on this subject in the course of a letter I am enclosing a pamphlet on the subject, published a little time ago by the Department, which I may supplement by stating that the subject is one which has recently engaged the attention of a special committee in England, and in the light of their last report I would suggest that the following precautions should always be followed in cases where animals abort:—

1. Isolate animals which have aborted and those which show any signs of impending abortion, keeping them outside of the building in which other pregnant animals are kept.

2. Disinfect aborting animals with sublimate solution in the manner recommended in the enclosed pamphlet.

3. When an animal has aborted see that any soiled litter, dung, and discharges are burned, together with the dead calf, and the foetal membranes.

4. Do not allow any animal which has aborted to be served till at least three months have elapsed since the date of abortion.

5. Disinfect the animals one day before service.

6. Disinfect the bull after service and also before serving any healthy animals.

So far as the cow which has aborted is concerned, I would suggest that you do not sell her, but that you keep her apart from the others, as it may very well be that she may now be immune and will carry her calf to full time, but if you have further trouble with abortion you might report again later.

As regards the sore teat trouble, these sores are often difficult to treat, as they are continually irritated by milking operations, but you might get your chemist to mix about 20 grains of tannic acid with four ounces of boracic ointment, and use that for a time instead of Zam-Buk.—C. E. GRAY, Principal Veterinary Surgeon.

CHEESE-MAKING, ETC.

As my farm is about forty miles from the nearest station (Middelburg) and as I have got at present about ten cows in milk, and later on intend to keep about 100 cows, I am very desirous of making an experiment with cheese-making, and should be very much obliged to you if you could put me in the way of making a start. I have got with me here a man who has learnt butter-making in Denmark, but he does not know how to make cheese. Could you kindly answer me the following questions and give me any other useful information ?

1. Do you think it possible to make good and payable cheese without having a man specially trained for that ?

2. Do you consider cheese-making pays as well as butter-making or selling your cream or milk ?

3. What implements are wanted, what is the cost of them, and where can they be had ?

4. What kind of cheese would you recommend to make ?

5. Where can you dispose of your cheese, and what can you get per lb. ?

6. How much milk goes to make 1 lb. of cheese ? and finally could you tell me how to set about making cheese, or in case you recommend any book, where can they be had ?

Answer.—Attached you will find several bulletins dealing with the subject of cheese-making. I expect you will find replies to some of your questions in these bulletins. I also append a list of firms supplying dairy implements.

It seems somewhat doubtful to me that a man not trained for cheese-making would make a good and payable cheese. He will have to learn cheese-making, and how long this learning will take will depend upon the individual. I know of cases where a man learned cheese-making in three months' time, and others where a man could not learn it in ten years.

100 lb. of milk, sold as such, would fetch from 7s. to 14s. free on

rail at Park Station, Johannesburg. 100 lb. of milk should yield some 11 lb. of ripe cheese at a value of about 9d. per lb., which comes to 8s. 3d. 100 lb. of milk should yield about 10 gallons of cream at 35 per cent., at 1s. to 1s. 3d. per lb. butter fat, that is, 3s. 6d. to 4s. 4d.

For really first-class local cheese there is at present practically an unlimited demand; the difficulty is that first-class local cheese is extremely rare. If you have any really good local cheese to offer I can easily help you to a purchaser, but it is useless to approach any firm before you have any cheese to offer.

Would you not consider supplying the Middelburg Creamery with cream? I am given to understand that this creamery will be completed about February.—R. PAPE, Superintendent of Dairying.

PREVENT BUTTER FROM GETTING SOFT.

May I address you to ask how I must treat butter to keep it from getting soft while being transported? On warm days I pack the butter in a tin, with wet cloths round it, all tins, again, I place in green shrubs and leaves to keep the sun off, and over all I place a wet bag, yet the butter arrives so soft and half molten that it often cannot be unpacked. I will really be grateful to you if you can help me with a good remedy.

I will also be glad if I can get several articles for butter-making, as the "starter", which according to your description in "De Boer", is added to the cream to give it the necessary acidity, also the instrument to measure the acidity. Further a little rennet to try cheese-making. If you are able to supply it you can inform me of the price and whether it can be sent by post.

Can you also advise me which is the best separator. I have a small hand-separator, the make is "Crown No. 00"; it is too small and old, but also has several points which I do not like. As I have to get a new machine I would like to have your advice which separator has proved to be the best.—Mrs. M. J. SCHIEL, Hillside, Louis Trichardt.

Answer.—Regarding the keeping of your butter during transport, a wet bag or cloths wrapped round the tin containing the butter will do well if it can constantly be kept moist and the tin be kept standing in a shady spot if possible. You must not forget that green herbage, especially leaves, generates heat, especially when covered with a dense stuff, such as a wet bag. Further the softness of your butter may be due to improper treatment, i.e. over-churning or over-working. For your information, however, I send you herewith several pamphlets dealing with butter-making and the transport of similar articles over distances. On the acidity, for instance, refer to Farmers' Bulletin No. 1, No. 36, page 6; temperature for churning, page 9; and further the notes on working, packing, etc. I advise you to carefully study these pamphlets, and am quite prepared to give you such further information should this prove necessary.

Of the several firms dealing in articles for butter-making, etc., I attach a list of names, together with the separators sold by them. (A good firm is that of J. C. Hand, Johannesburg, also Henwood, and Beckett.) Of the separators much in use are the Alfa Laval, Perfect, Melotte.

I have no supply of cheese rennet, but can refer you to the attached list of firms dealing in the necessary articles for cheese-making, prices of rennet, etc.

For your further information I send you a list of all the publications that have appeared so far of this division. They are to be had free from the Government Printer.—R. PAPE, Superintendent of Dairying.

SEPARATOR MILK FOR CALVES.

Will you please inform me to what extent separator milk can be used for the feeding of a calf? I have a few good Friesland calves that have been taken away from the mother, and I would like to rear them well, but do not know whether this milk can be used for that purpose. I am advised to add linseed meal; if this is good, how much meal and how much milk should the calf get per day? Can sweet milk be mixed with the separated milk with good result, if so, how much of each, and how much must the calf get per day? Where can I obtain linseed meal, and at what price?—M. F. SCHEFFER, Amersfoort.

Answer.—Separated milk, though not so good as buttermilk or whey for calves, can yet be used when a little soured and mixed with mealie meal or other meal, and for that matter with linseed meal. Feed for calves may be given twice daily, the quantity depending on the age of the animals, of this you can judge for yourself. It must be noted that the feeding of calves as above stated should be commenced with when they are about six weeks old, and only in such quantities that they do not "fatten" exactly but remain in "good condition", that is, in good health.

In the beginning no separator milk is given; this has to be done gradually after about six weeks, and the quantity of separator milk added to the cow's milk can gradually be increased.—R. PAPE, Superintendent of Dairying.

SWISS MILKING GOATS.

I shall be much obliged if any of your readers can inform me what quantity of milk it is possible for a Swiss goat to produce at one milking.—W. R. KEY, P.O. Imvani.

Swiss goat ewes running on good Karoo veld in the Cape Province have averaged six bottles per diem—equal to one gallon. Half-bred Swiss goat ewes have given as much as four and a quarter bottles.—EDITOR, *Agricultural Journal.*

Cattle Dipping and Arsenical Poisoning.

REPORT TO THE BOARD OF HEALTH, NATAL.

[These reports have been published in the *Cape* and *Natal Journals*, and are reprinted now for the information of Transvaal and Free State readers.]

1. INTERIM.

THE Committee of the Board appointed on 26th August, 1910—"to inquire, investigate, and report (*a*) whether the use of arsenical preparations for cleansing animals, of which the meat or other products are used by man for food or as the raw material of industries, is, or is likely to be, prejudicial to the interest of the consumer or the workman; (*b*) if so, to what extent; and (*c*) if so, what measures should be adopted to abolish or to limit the risk"—now submits its interim report as appended:—

1. It appears that the likelihood or possibility of milk and meat becoming impregnated with arsenic, as the result of use of salts of the metal as components or preparations for external application to kill ticks, had not received much or any consideration otherwise than as a possible fortuitous accident, until the issue of a report by the Government Bacteriologist in Natal, entitled "Dipping and Tick-destroying Agents, Part 2". This is attributable partly to the fact that it was understood that animals generally were dressed only at fairly long intervals, and partly to a general impression that aqueous solutions were not absorbable, to any extent, through unbroken skin, especially in such short application, as is practicable, in the process of cleansing cattle.

2. The report referred to placed matters in a different light altogether, for, not only does it urge the dressing of all cattle at such short intervals as five days, but it discloses evidence that arsenite of soda is absorbed in large quantity by the skin, in the process of cleansing, and is eliminated by the urine; and, further, demonstrates that routine dressing results in a storage in the deep layers of the *cutis vera*, upon which it is asserted that its success in tick-destroying depends. The report shows that, even so long as 120 hours after spraying, practically four grains of arsenic may be recovered from the *cutis vera* of one square foot, and over five grains from the scurf and hair covering the same, while it continues to be excreted in the urine certainly up to 72 hours, presumably much longer. This certainly afforded *a priori* ground for expecting that the metal would be recoverable, in at least small quantities from the meat, and especially from liver, stomach, and kidneys; and that traces might be found in the milk. It was, however, prima facie unlikely that it would be found in any important proportion in the latter, because it was known that the Nels Rust Dairy,

which conducts a very large business in Durban, had been using "laboratory dip" at short intervals for a long period, and nothing had happened to suggest that the consumer had in any way been prejudiced. Against this, however, needed to be off-set the fact that this dairy derives much of its milk from other farms, many of whom use no dip or cleansing process at all, and perhaps few use it at short intervals. In the matter of meat, it appears that, for the most part, animals which are sent for slaughter have not been subjected to any regular cleansing at short intervals, and the fact that no harm had yet resulted from eating of meat was no guarantee that harm would not result if the process should become general.

3. A few days after your committee was appointed articles on the subject and letters appeared in the newspapers, the former largely based upon information and speculative ideas obtained from a medical practitioner in Pietermaritzburg, and popular apprehension was aroused.

4. Your committee deems it fortunate that it is able to demonstrate that the apprehension was groundless.

5. Your committee held two meetings, the first to decide upon its course of investigation on 30th August, the second on 22nd September to consider the results of its inquiry and to formulate a report.

6. Your committee determined that the only suitable means of ascertaining whether the products of animals treated with arsenical preparations for destruction of ticks are likely to be prejudicial to the consumer is by analysis of a sufficient number of samples for the presence of arsenic; and if arsenic is found to be present, to ascertain the ratio to a given quantity of the products.

7. Your committee accordingly arranged to obtain from the Nels Rust Dairy daily samples of milk from ten specific cows, so as to secure it both before and after treatment of the animals; and to obtain from a butcher, who had purchased some fat stock from Nels Rust Estate, the kidneys and a portion of the liver, stomach, and muscle substance—in one instance on the day succeeding, and on the other seven days after treatment by dipping.

Dr. Murison also undertook to have analysis made of milk obtained from various purveyors in Durban, and the Town Clerk of Durban furnished to the committee a report from the Chief Sanitary Inspector, giving the results reported by the Borough Analyst.

The Government Bacteriologist has also put in a statement showing certain other observations which have been made by him or on his behalf.

MILK.

8. The reports of the Government Analyst of analyses of milk show that seventy-eight samples were analysed:—

A. One bulk sample from Model Dairy, Durban.

B. Two bulk samples from Natal Creamery, Pietermaritzburg.

C. Forty-five samples obtained, one from each of five identified cows, on each of nine days, from Nels Rust Estate, at intervals of from 32 hours to 7 days after dipping.

D. Thirty samples obtained, one from each of five identified cows, different from C, on each of four days, and two on a fifth day from Nels Rust Estate, at intervals of from 7 to 160 hours after dipping.

Two hundred cubic centimetres (7 oz.) of each were analysed by Reinsch's method, and no trace of arsenic found, although control observations showed that when 1/5000 part of a grain was added to 200 cubic centimetres of milk, its presence was readily revealed. The results in some instances were checked by the Gutzeit method, and though some reaction was obtained on three occasions, the result was equivocal, and if the reaction was caused by the presence of arsenic, the quantity was less than 1/330000 part of a grain in a tumbler of milk.

9. Your committee has been furnished by Mr. Joseph Baynes, of Nels Rust, with a statement that he has dipped all his stock regularly since 1902, but for some years only once a month; that formerly he used "Queensland Dip" (composition unknown to your committee), but since September, 1909, he has employed the "laboratory dip" every five days from September, 1909, to February, 1910, and thereafter to date, once in every seven days.

Your committee is informed that laboratory dip contains 0.169 per cent. of arsenic.

10. The report of the Durban Borough Analyst shows that six samples were obtained from five purveyors, one of whom uses laboratory dip and one arsenite of soda once a week; two use Erkenbrach's dip once a week, and one this same dip once a fortnight. In one instance only was a trace of arsenic, too small to be estimated in quantity, revealed. In this case the udders had been washed with dip on the preceding day, and another sample taken a week later gave no reaction. The processes of analysis used were Reinsch's and Gutzeit's.

11. Your committee is of opinion that the faint traces, if any, discovered were probably due to fortuitous contamination with arsenic rubbed off the hair and skin.

12. Your committee, therefore, concludes that the use of arsenical dips at short intervals does not result in the appearance of arsenic in the milk, and that the practice is entirely devoid of danger to the consumer.

13. Your committee is unable to treat seriously the statement that arsenic was found in higher ratio than 1/100 part of a grain to the gallon of milk or the 1 lb. of meat. It is indeed possible that the deposit which was found on copper wire was of arsenic, but in view of the numerous analyses which we have made with negative results, we can only account for this by the probable presence of arsenic as an impurity in the reagents used.

MEAT.

14. The report of the Government Analyst shows that no trace of arsenic was found in 100 grammes (about 3½ oz.) of tripe, liver, and kidneys of each of two beasts from Nels Rust Estate. Seeing that he states that the processes employed would reveal 1/5000 part of a grain

in 200 cubic centimetres of milk (approximately 1/2000 part of a grain to 1 lb), it may be said that arsenic is not to be found in these organs of a beast. The analyses of muscular tissue are not complete, but it would certainly be anticipated that, if anywhere, arsenic would be present in liver and kidneys.

15. The statement of the Government Bacteriologist indicates that, even when, in addition to regular dipping and spraying with laboratory dip, arsenic is injected into the veins in such large quantities as 24 grains in seven doses, in the days immediately before death, although the metal is present abundantly in the urine, it cannot be recovered from the liver or muscular tissue, and only in quite equivocal reaction even from the kidney substance.

16. Although your committee is satisfied that there is no ground whatever for apprehension that the consumer will be in the slightest degree prejudiced by the meat of animals dressed with arsenical dips, it does not feel justified in making a positive statement that arsenic is not present in the muscle substance, until the analyses are completed.

17. Although your committee did not anticipate that arsenic would be found in anything but exceedingly minute proportions in the products of treated animals, it has come as some surprise that no vestige is to be found in the milk, when it is a matter of common knowledge that many drugs and articles of food readily affect the mammary secretion; and still more, that no trace is discoverable in the meat, even at the very time when its presence can be demonstrated in the urine, to gain which it must have passed through the general circulation. This is a matter of great scientific interest, which, however, your committee has no means to follow up, but does not affect the fact, with which alone your committee is at present concerned, that it is not found there.

18. Your committee has yet to determine to what extent arsenic may gain entry to the milk with hair and scurf from the flanks of the cow, and to what extent the arsenic so entering is soluble. It is, however, plain, from the work already done for the committee, that arsenic does not enter into solution in the milk in this manner constantly, and if it does so at all, the entry is in the nature of an accident. Any results which might be obtained would not affect the main question.

19. Your committee has also still under consideration the question of risk in the handling of hides, and proposes to report upon this, and the matter of the foregone paragraphs, at the next meeting of the board.

20. Your committee cannot conclude this report without expressing its very great indebtedness to Dr. Murison, Medical Officer of Health for the Borough of Durban, one of its members, for his assistance in loaning the full services of a sanitary inspector in his department to travel daily to Nels Rust Dairy, and to personally see the cows milked and bring the samples taken to Maritzburg and to deliver them at the laboratory. The committee is entirely satisfied with the manner in

which Mr. Smith performed the duties, and suggests that the board signify its appreciation to him through the proper channels.

21. Your committee is pleased to be able to place on record its opinion, arrived at after the most careful investigation, that the rumours and statements that have appeared in the public Press on this subject are absolutely without foundation.

On behalf of the committee.

JAMES HYSLOP, Chairman.

Durban, 22nd September, 1910.

The above report, which represents an altered copy of the committee's draft, was adopted by the board at its meeting held in Durban on 23rd September, 1910.

D. ROBB, Secretary, Board of Health.

2. FINAL.

1. Your committee has received a further report by the Government Analyst, put up herewith (Annexure D), showing that 100 grammes of the muscle substance, liver, and kidney from a twelve months old bovine which had been subjected to regular dipping in the "laboratory" preparation ever since its birth, at intervals never longer than a fortnight and, except for a short period in winter, regularly once a week, have been analysed, and no trace of arsenic found. Thus the committee has had before it analyses of muscle substance, liver, and kidney of four animals and of the stomach of two. All the four animals had been regularly dipped before slaughter at intervals of not more than one week. The analyses show that arsenic was not in any instance found in the stomach or the liver and only in one instance in the kidneys, and then only in quite equivocal reaction. The kidney was in that case obtained from a beast that had not only been dipped but subjected to intravenous injections of arsenical solution. Your committee found that exceedingly minute traces were detected in the analyses in two samples of muscle substance. These samples, however, were taken by a butcher from the carcasses at the time of slaughter; whereas other two samples, taken specially with great care from animals that were slaughtered for the purpose of the committee's investigation, revealed no sign of arsenic at all.

2. Your committee accordingly feels itself justified in assuming that the arsenic, which was present in the meat obtained from the butcher's hands at the abattoir in Pietermaritzburg, was due to an accidental contamination from arsenic present on the hides of the beasts. In any case the amount was so infinitesimal as to be entirely negligible and incapable of producing any ill-effect upon the consumer, even if the meat were eaten daily in considerable quantities.

3. Your committee may recall the report of the inquiry of a royal commission in England, some ten years ago, upon the presence of arsenic in beer, in which it was said that the commission considered that one-hundredth part of a grain of arsenic to a gallon of beer was an

amount which should be inadmissible as being probably injurious to the consumer ; and your committee would point out that a hundredth part of a grain would be a gross amount of arsenic in comparison with the infinitesimal quantities which had been found in a few of the analytical tests made in the course of this inquiry.

4. From the Government Bacteriologist the committee has learned that he has had rubbings made of the skin of the udders of cows that had been regularly dipped introduced into the milk samples, in quantity far in excess of any which would gain access to the milk in the ordinary course of milking. But even under these conditions the analyses did not reveal the presence of arsenic in any appreciable degree.

5. With reference to possible danger to persons handling hides taken from dipped animals, your committee has made some inquiry and found that the use of arsenic as a dressing for hides is a practice which some firms have carried on for a number of years ; and as there has been nothing noted or observed that suggests injury resulting to the persons handling such hides, your committee is of opinion that there is no ground for apprehending danger from that source.

6. Notwithstanding the fact that your committee has found no evidence that arsenic in any but entirely negligible quantity does gain access to milk, by accidental contamination from the scurf and hair removed from the skin of an animal in the process of milking—in fact the evidence obtained points in the opposite direction—yet your committee thinks that every practicable means should be taken to impress upon the owners of dairy herds and cow-keepers the desirability of properly cleansing the udders of cows before milking is started. Such a practice is very desirable for hygienic reasons.

7. It has been brought to the notice of your committee that a letter has appeared in the *Times of Natal* quoting an occurrence of illness, in the month of September, among natives working with a Public Works Department road party in the Helpmakaar District, as an instance of acute poisoning by arsenic ingested with meat of an animal that had been dipped. This occurrence was duly reported to the Health Officer in Natal and inquiries were made by him, the result being that it was stated by the owner of the animal that it had not been dipped since March, 1910.

8. This report, with that previously submitted, concludes a record of the results of your committee's investigations. These are of such a nature that it is hoped they will serve to set at rest any public apprehension which has been aroused as to the safety of the consumption of milk, meat, etc., from animals which have undergone dipping or spraying with solutions of arsenic.

On behalf of the committee.

JAMES HYSLOP,
Chairman.

Pietermaritzburg, 20th October, 1910.

ANNEXURE D.

In the concluding paragraph of my report of the 21st ultimo I referred to the desirability of a further analyses of the flesh (muscle) of a systematically dipped beast. This suggestion was made because minute traces of arsenic were detected in both samples of muscular tissue examined. The amount of the compound present was so small that in such an article as meat it would have no serious import. It appeared probable, moreover, that the flesh might have become contaminated after slaughter, as both the animals had been killed at the Government abattoir, Pietermaritzburg. It is not unreasonable to suppose that the floor of the slaughter-house and the hands and knives of the butchers should be decidedly contaminated by contact with the outer surface of the skins of beasts.

I have now to report that I have examined samples taken from a beast which was slaughtered with special precautions against accidental contamination. The beast was about twelve months old and is stated, on reliable authority, to have been dipped in laboratory dipping-fluid every week since the age of three weeks. I have been unable to detect any arsenic in 100 grammes each of the kidney, liver, and muscular substance of this animal.

WATKINS PITCHFORD, M.D.,
Government Analyst, Natal.

Notes on the Weather (Cape Province), November, 1910.

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MEAN atmospheric pressure higher than usual; sub-normal temperature, both days and nights cooler than usual; some frosts; skies clearer than usual, with a diminished fog-frequency; rainfall in excess of the average in the west and south-west, but only about half the usual depth over the rest of the country; a moderate number of thunderstorms, comparatively local in distribution, except on three days; a few destructive hailstorms; strong cold winds. Such were the more prominent features of the weather of November, 1910.

Division.	Mean Rainfall (1910).	Mean No. of Days.	Average Rainfall (1891–1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches		Inches.		Inches	Per cent.
Cape Peninsula ..	2·44	9	1·57	6	+ 0·87	+ 55
South-west	1·83	5	0·94	4	+ 0·89	+ 95
West Coast	0·61	3	0·32	2	+ 0·29	+ 90
South Coast ..	1·91	10	2·57	7	— 0·66	— 26
Southern Karroo ..	0·61	3	1·10	3	— 0·49	— 45
West Central Karroo	0·27	2	1·04	2	— 0·77	— 74
East Central Karroo	0·85	4	1·36	3	— 0·51	— 38
Northern Karroo ..	0·76	2	1·27	3	— 0·51	— 40
Northern Border ..	0·73	3	1·22	4	— 0·49	— 40
South-east	2·23	8	3·25	7	— 1·02	— 31
North-east	0·86	4	2·52	6	— 1·66	— 66
Kaffraria	1·59	8	3·31	8	— 1·72	— 52
Basutoland	1·82	8	3·21	8	— 1·39	— 43
Bechuanaland ..	1·20	6	2·29	6	— 1·09	— 48
Rhodesia	1·74	7	3·61	11	— 1·87	— 52

Precipitation.—The mean rainfall during November, based on the data available for 319 stations, amounted to only 1·45 inches on six days, being 0·96 inches or 39 per cent. below the normal. This mean is 0·38 inches more than that of November, 1909, but only half that recorded during the previous month. The accompanying table shows that only two divisions had a mean precipitation exceeding two inches (2 inches), viz., Cape Peninsula and the South-east, the former showing an excess of 55 per cent. over the average, and the latter a deficit of 31 per cent. The mean rainfall was above the average over only the Cape Peninsula, South-west, and West Coast, the two latter having almost twice their normal quantities. Elsewhere there was a partial failure of the rains this month, causing a shortage ranging from 26 per cent. along the South Coast to 74 per cent. over the West Central Karroo. Compared with the preceding month, the rainfall was heavier over the South-west, West Coast, Southern Karroo, and Northern Border, but lighter elsewhere, whereas, compared with November of the previous year, the only sections showing a falling off in the amounts recorded were West Central Karroo, North-east, Kaffraria, and Basutoland. Summarizing the monthly totals, it is found that of the 319 stations only 6 had "Nil", 40 had 0·01–0·50 inches, 89 had 0·51–1·00 inches, 109 had 1·01–2 inches, 46 had 2·01–3 inches, 21 had 3·01–4 inches, 6 had 4·01–5 inches; the two largest amounts being 6·78 inches at Evelyn Valley and 7·10 inches at Fort Jackson. On analyzing the maximum amounts in twenty-four hours it appears that of 300 stations 159 had Nil to 0·50 inches, 107 had 0·51–1·00 inches, 32 had 1·01–2 inches; the only two having maxima exceeding 2 inches being Fort Jackson, with 2·50 inches on the 24th, and Ceres, with 2·63 inches on the 10th; the third greatest quantity in one day being 2·00 inches at Elgin (Plantation) on the 10th. The number of thunderstorms were about the same as last month, but greater than during November of the previous year, 347 occurrences of this nature being noted on twenty-five days of the month. These were most wide-spread on the 27th, 21st, 3rd, and 2nd, being mostly very local on the other dates. Hail fell at forty-one stations on thirteen days, most widely on the 3rd; some damage was caused to fruit trees during the month by storms of this nature at Kokstad and Sunnyside (Hay Division). Snow fell at The Oaks (Ceres) on the 11th, and sleet at one station on the 7th. Precipitation was favourable to agriculture over the West and South Coasts, parts of the South-east, and Kaffraria, but inland, owing to the partial failure of the rains, crops were suffering severely and dams failing in some areas.

Temperature, Cloud, and Wind.—The mean temperature of the month of all stations was 63° ·2, or 2° ·0 higher than in October last, but 1° ·5 lower than during the corresponding month of 1909. The mean maximum temperature (74° ·7) was 3° ·2 above the mean of the previous month, and 1° ·6 lower than in November of the preceding year, and the mean minimum (51° ·8) was only 0° ·9 higher than during the immediately preceding month, but 1° ·4 lower than in November, 1909. The mean daily range (22° ·9) was 2° ·3 greater than during October, and 0° ·2 less than during the same month of the previous year. Compared with the averages the monthly mean was 1° ·4 lower than usual, the defect being mainly due to the night temperatures being 2° ·0 below the normal, whilst there was a deficit of only 0° ·8 in the day temperatures, resulting in an increase of 1° ·2 in the mean daily ranges. At the individual stations the mean monthly temperature was generally below the normal, the deficits being mostly only between a few tenths and one degree in the West and South, but increasing to over two degrees in the east and north, the extremes being 4° ·5 at Kimberley, and 0° ·2 at Van Staaden's. At O'okiep, however there was an excess of 1° ·6, and at one or two stations in the South-east, e.g. Bedford, there were small excesses of one or two tenths of a degree. The mean maxima were below the averages at two-thirds of the stations, considerable variation, however, being shown in the amounts, and signs of the departures from the normals at stations in the same section, e.g. at Lovedale the mean maximum was 3° ·0 less than usual, whilst at Bedford there was an excess of 1° ·1. The deficits varied between 5° ·9 at Hopefountain, in Rhodesia, and 5° ·3 at Kimberley, and 0° ·1 at Umtata and Main, whilst the surplus amounts ranged from 1° ·9 at Port Nolloth to 0° ·3 at Storms River. The mean minima were practically everywhere below the averages, mostly by one to two degrees in the South-west, parts of the South, South-east, and mostly by two to four degrees over the rest of the country, ranging from 4° ·5 at Hanover to 0° ·4 at Amaliensteur. At O'okiep the mean minimum was 1° ·8 above the normal. The warmost station was Mochudi, with a mean of 70° ·7, and the coolest, Devil's Peak (Table Mountain), with 56° ·6, a difference of 14° ·1. The highest mean maximum was 84° ·5 at Mochudi, and the lowest mean minimum 43° ·7 at Hanover. The highest temperatures recorded at the various stations were not confined to any particular period, but occurred on thirteen days, distributed fairly evenly throughout the month, with a maximum on the 14th and 15th. The mean value of these readings was 90° ·0, or only 0° ·4 higher than in October, but 4° ·1 lower than in November of 1909. The lowest readings were mostly recorded between the 5th and the 13th, but also on the 16th, 20th, 21st, and 29th. The mean value of these temperatures was 41° ·8, or 1° ·7 higher than during the preceding month, but 2° ·5 lower than during the corresponding period of the previous year. The mean monthly range was, therefore, 48° ·2. Temperatures of 100° and upwards were confined to two stations, viz., Lovedale, with 100° ·0 on the 2nd and 15th, and Uitenhage, with 103° ·2 on the 2nd, and temperatures below freezing point also to two stations, the lower reading being 30° ·0 at Hanover on the 6th, Aliwal North being next with 31° ·5. There was, therefore, an extreme monthly range of 73° ·2. The occurrence of frost was practically limited to the period extending from the 4th to the 13th, nineteen instances of this phenomenon being noted during these ten days, whilst the only station reporting frost later was Waverley, on the 29th. These low temperatures would appear to have caused considerable damage to crops at Carnarvon Farm, and apparently also at Herschel. At Retreat (Cape Peninsula), the mean minimum *on grass* was 47° ·1, or 6° ·0 lower than the shade minimum; temperatures below 40° were recorded on six days, the 4th to 6th, 8th, 9th, and 20th, the lowest reading being 36° ·2 on the 9th and the highest, 54° ·3, on the 16th.

The mean amount of cloud was comparatively low, only 41 per cent. or 5 per cent. less than during October last, and 6 per cent. less than in November of the previous year. The cloudiness showed a progressive increase from North to South and from West to East over those divisions bordering on the coasts, being 32 per cent. over the West Coast, increasing to 38 per cent. over the Cape Peninsula, 42 per cent. over the South-west, 46 per cent. along the South Coast, falling slightly to 42 per cent. over the South-east, but rising to 51 per cent. over Kaffraria. Inland from the South Coast it fell to about 30 to 35 per cent., dropping to 13 per cent. over Bechuanaland, but rising to 44 per cent. at Kimberley and 55 per cent. at Hopefountain. The skies were most obscured at Port St. John's (69 per cent.) and least at Mochudi (11 per cent.). Fogs and mists were of much less frequent occurrence than usual, being noted only seventy-nine times on twenty-seven days; occurrences of this nature were most numerous on the 16th, 17th, and 22nd to 26th. The 6th, 9th, and 10th were the only dates devoid of these phenomena. The prevalent winds were southerly (SE. to SW.), from Port Nolloth to Cape Agulhas, westerly along the south coasts to Port St. John's, and south-westerly at Durban. Over the eastern half of the Colony the winds were mostly westerly (NW. to SW.), northerly at Kuruman and Kimberley, north-easterly at Teyateyaneng and Mochudi, and south-easterly at Hopefountain. The mean force was 2 ·08 on the Beaufort scale, equivalent to a velocity of 8 ·2 miles per hour, or 0 ·9 mile per hour less than last month, and the same as in November.

1909. The winds were strongest along the south coast and were relatively much stronger over the western than over the eastern half of the Colony. At the Royal Observatory there was an excess of west-north-westerly and southerly winds, but a decreased frequency of all others between NNW. and WSW., as well as of those from SSE. The mean velocity there was 7 miles per hour, or 0·2 mile per hour less than usual. Gales were much more frequent than usual, being noted at fifty-four stations on eighteen days, mostly on the 7th and 27th. A whirlwind outside Kokstad on the 26th caused considerable damage to a farm about three miles distant, carrying away large huts, overturning a wagon, etc. Hot winds were noted at eight stations on four days, principally the 15th. No duststorms reported.

The mean barometric pressure at the Royal Observatory was 30·06 inches, or 0·03 inch higher than the normal, ranging from 29·78 inches on the morning of the 27th to 30·36 inches on the morning of the 12th.

TEMPERATURE.

Station.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory	71·6	54·6	63·1	91·6	14th	47·1	8th
Capetown (S.A.C.)	73·7	54·1	63·7	96·0	14th	47·0	20th
Table Mountain (Devil's Peak)	65·8	47·5	56·6	88·0	14th	40·0	11th
Groot Constantia	69·4	52·7	61·0	86·0	14th	47·0	20th
Wynberg	71·3	52·3	61·8	87·0	14th	44·0	11th
Bishopscourt	67·9	49·8	58·8	84·0	6th	42·0	9th & 21st
Retreat	70·3	53·1	61·7	86·9	6th	45·2	5th
Elsenberg Agricultural College	73·3	48·9	61·1	93·9	14th	43·1	9th
Robertson Experimental Farm	79·8	59·6	69·7	97·5	14th	50·0	9th
Groot Drakenstein	76·5	53·1	64·8	95·8	14th	43·5	20th
O'okiep	79·2	52·4	65·8	94·5	30th	39·7	11th
Port Nolloth	66·5	49·0	57·8	98·0	15th	40·5	9th
Port Elizabeth	69·2	55·5	62·4	81·0	15th	49·0	9th, 13th, & 20th
Storm's River	72·3	51·1	61·7	88·0	14th	40·8	13th
Cape Agulhas	67·1	55·2	61·2	72·0	27th	46·0	20th
George Plantation	71·5	51·0	61·2	83·0	8th	42·0	20th
Heidelberg	79·7	52·2	66·0	94·0	14th	42·0	13th
Cape St. Francis	66·8	57·3	62·0	74·0	27th	48·0	20th
Van Staaden's	72·8	51·7	62·2	97·0	2nd	42·0	20th
Uitenhage	78·0	52·0	65·0	103·2	2nd	40·0	6th
Mossel Bay	69·9	54·3	62·1	80·0	10th	45·0	13th
Amalienstein	82·7	51·8	67·2	99·0	2nd	45·0	11th
Murraysburg	79·1	50·0	64·6	91·0	25th	38·0	10th
Hanover	79·9	43·7	61·8	88·0	5th	30·0	6th
Kimberley	84·9	52·5	68·7	97·3	25th	42·5	11th
Bedford	77·5	49·2	63·4	97·0	2nd & 15th	38·0	6th
Lovedale	78·1	52·3	65·2	100·0	2nd & 15th	41·0	6th
Stutterheim	74·7	51·2	63·0	94·1	15th	40·0	9th
Cathcart	71·2	45·7	58·4	87·7	15th	33·4	13th
Sydney's Hope	73·4	51·4	62·4	98·0	2nd	41·8	11th
Aliwal North	79·6	47·1	63·4	90·0	25th	31·5	12th
Umtata	77·3	52·5	64·9	95·0	15th	40·0	29th
Kokstad	73·5	48·6	61·0	87·0	10th	37·8	7th
Tabankulu	74·1	49·6	61·8	70·3	10th	34·0	6th
Main	75·1	49·0	62·0	92·8	15th	38·6	29th
Port St. John's	74·8	60·2	67·5	82·0	12th	50·0	6th
Teyateyaneng	75·3	45·7	60·5	85·0	25th	36·0	12th
Mochudi	84·5	56·9	70·7	94·0	18th & 24th	49·0	8th & 16th
Kuruman	83·0	50·1	66·6	91·0	24th	36·0	8th & 11th
Hopefountain	78·3	56·9	67·6	91·2	10th	46·0	7th
Means	74·7	51·8	63·2	90·0	—	41·8	—
Extremes	—	—	—	103·2	2nd	30·0	6th

OBSERVERS' NOTES.

Kokstad.—Severe hailstorms fell in district, doing damage to fruit trees.

Slaate.—Great heat; veld becoming parched; crops withering.

Somerville (Tsolo).—Fruit early and potatoes exceptionally good. Sowing of maize proceeding slowly for want of rain.

Algeria (Clanwilliam).—The weather has been particularly pleasant throughout the month; only a few hot days; heavy dew almost every morning.

Harkerville.—Crops looking well; corn, oats, etc., ripening.

Kruis River (Uitenhage).—On the whole a very favourable month for the farms. Rainfall an inch more than last year. Crops of mealies, beans, pumpkins, and watermelons looking well, though late. Forage crops are now reaped, though owing to late rains it is rather short, but quality very good. Stock in good condition. The melon crop, through the rains being late, will be backward this season.

Uitenhage Park.—Rainfall below average of nine years (1901–09), but more than severa previous Novembers. A very large amount of wind from SW.

Krom River (Beaufort West).—Farmers trekking with small stock.

New Bethesda (Graaff-Reinet).—Badly in want of good soaking rains. Crops (wheat and lucerne) suffering much. Consequences will be serious unless it rains soon.

Huxley Farm (Stutterheim).—Live stock doing well and selling at high figures. Young mealies coming on fine.

Herschel.—Crops poor—suffered drought and frosts.

Sunnymeade (Albany).—Extremely cold month. Cloudy most of the time, but very little rain. Stock suffered and fallen off owing to cold winds.

Gamtoos Station (Humansdorp).—Very strong winds during all the month; much cloud.

Calitzdorp.—Strong varying winds for two or three hours each day, early or late in the day.

Theefontein (Hanover).—Winds varied between NW. and SW., mostly cold. Gales on the 3rd and 7th. Frosts on the 4th, 5th, 8th, 9th, 10th, and 12th, doing no damage. Early mornings and evenings very keen. An unusually cool November. The inch of rain on the 21st was a great help to perishing crops. More wanted badly.

Douglas (Voss).—At times weather quite cold. Slight frost on the 10th, very little damage done. Veld dry, rain badly wanted. Farmers losing stock. Fruit crops promise to be good.

Sunnyside (Hay).—The rainfall for November, 1910, has been exceptionally good when compared with November, 1909, and November, 1908, the amounts registered being 1·18 inch, 0·06 inch, and 0·95 inch respectively. Veld looking green and fresh; all classes of stock reviving wonderfully in consequence. Ploughing for mealies in full swing. Fruit trees looking very healthy and bearing well, though slightly damaged by hail.

Clifton.—Very dry; crops dying for want of rain.

Lyndene (Albert).—Country very dry; dams getting low.

Groot Drakenstein.—The temperature was very changeable during the month, but the mean was only slightly below the normal (0·2). There was a marked absence of wind, especially of the strong south-easters usually so prevalent. Rainfall nearly double the average.

Kokstad (Coyte).—Rather a dry month for November. Fruit is in excellent condition, and very plentiful. A whirlwind was seen approaching the town on the afternoon of the 26th, but dispersed before reaching us. It caused, however, considerable damage on Mr. Green's farm, some three miles away, carrying away his large huts bodily and overturning a wagon and doing other damage.

Carnarvon Farm.—This has been the lowest November rainfall for the last ten years bar 1904, when we had only 0·12 inch. Winds a little above the average. Frosts nearly double last ten years' average. Crops looked most promising, but the constant gales and severe frosts of this and the latter half of last month have made prospects gloomy, and in many instances crops are beyond hope now. Stock of all sorts are recovering, though slaughter stock are scarce and dear. Fruit season will be poor in most parts of this district. Many orchards were killed outright in the early part of this month.

	Rain.	Wind.	Frost.	No Clouds.	Rainy Days.
1901	52	6	3	1	8
1902	85	11	6	6	2
1903	235	13	2	1	2
1904	12	17	1	0	4
1905	125	6	2	1	5
1906	318	6	2	0	13
1907	192	17	4	0	6
1908	62	18	4	0	5
1909	69	13	4	1	4
1910	41	14	6	0	5
TOTALS	1191	121	34	6	54
MEANS	119	12	3½	½	4½

Rainfall, December, 1910.

I. CAPE PENINSULA:	Inches.
Royal Observatory (a) 12-inch gauge	1·47
Capetown Fire Station	1·52
Do. South African College	1·92
Do. Molteno Reservoir	1·89
Do. Platteklip	2·33
Do. Signal Hill	1·07
Do. Hospital	—
Sea Point (The Hall)	1·32
Do. (Attridge)	—
Camp's Bay	0·90
Table Mountain, Disa Head	1·77
Do. Kasteel Poort	—
Do. Waai Kopje	—
Do. St. Michael's	—
Devil's Peak Blockhouse	2·95
Do. Nursery	2·59
Do. Lower Gauge	—
Woodstock (The Hall)	—
Do. (Municipal Quarry)	—
Do. (Do. Nipher's Shield)	—
Newlands (Montebello)	—
Claremont (Carrigeen)	—
Bishopscourt	3·35
Kenilworth	2·71
Wynberg (St. Mary's)	3·06
Groot Constantia	2·73
Tokai Plantation	3·00
Plumstead (Culmwood)	—
Muizenberg (St. Res)	3·55
Fish Hoek	—
Simonstown (Wood)	—
Do. (Gaol)	—
Cape Point	0·58
Blaauwberg Strand	—
Robben Island	0·97
Durbanville	—
Maitland Cemetery	1·15
Tambcers Kloof	1·75
Lower Reservoir	1·88

II. SOUTH-WEST:	Inches.
Eerste River	1·67
Klapmuts	1·86
Stellenbosch (Gaol)	1·98
Somerset West	2·45
Paarl	2·09
Wellington (Gaol)	1·36
Do. (Huguenot Seminary)	2·00
Groot Drakenstein (Weltevreden)	2·29
Porterville Road	—
Tulbagh	1·23
Ceres Road	—
Kluitjes Kraal	2·46
Ceres	4·21
The Oaks	0·85
Rawsonville	—
Caledon	—
Worcester (Gaol)	0·95
Do. (Meiring)	—
Do. (Station)	—

II. SOUTH WEST (continued):	Inches.
Hex River	066.
De Doorns	—
Karnmelks River	1·99
Lady Grey (Division Robertson)	0·37
Robertson (Gaol)	0·49
Do. (Govt. Plantation)	0·47
De Hoop	—
Montagu	0·81
Danger Point	—
Vygebooms River	—
Elgin Plantation	3·93
Elsenb rg Agricultural College	1·31
Berg River Hoek	—
Wemmer's Hoek	—
Roskeen	2·34
Vruchtbaar	—
Agricultural Experiment Farm, Robertson	4·43
Waverley (Tulbagh)	1·81

III. WEST COAST:	Inches.
Port Nolloth	
Do. (Lieut. Barker)	0·00
Anenous	0·02
Klipfontein	—
Kraaifontein	0·00
O'okiep	0·07
Springbokfontein	—
Concordia	0·06
Concordia (Kraphol)	—
Garies	0·27
Lilyfontein	0·59
Van Rhyn's Dorp	0·12
Clanwilliam (Gaol)	—
Do. (Downes)	—
Dassen Island	0·95
Kersefontein	0·64
The Towers	—
Abbotsdale	—
Malmesbury	0·98
Piquetberg	2·30
Zoutpan	—
Welbedacht	—
Hopefield	0·45
Algeria (Clanwilliam)	1·02
Cedarberg (Clanwilliam)	2·02
Wupperthal	0·28

IV. SOUTH COAST:	Inches.
Cape Agulhas	1·15
Bredasdorp	—
Swellendam	2·01
Potberg	—
Zuurbrak	—
Grootvaders Bosch	3·12
Heidelberg	0·85
Riversdale	0·90
Melkhoutfontein	—
Vogel Vlei	—
Geelbek's Vlei	—

IV. SOUTH COAST (*continued*):

	Inches.
Mossel Bay	1·14
Great Brak River	0·88
George	1·35
George (Plantation)	1·36
Woodifield (George)	—
Ezeljagt	—
Millwood	3·08
Sour Flats	1·56
Concordia	—
Knysna	—
Buffel's Nek	3·10
Plettenberg Bay	2·37
Harkerville	4·28
Forest Hall	—
Blaauwkrantz	2·86
Lottering	1·91
Storm's River	3·18
Witte Els Bosch	3·33
Humansdorp	2·08
Cape St. Francis	1·65
Hankey	—
Witteklip (Sunnyside)	—
Van Staaden's (Intake)	2·34
Do. (on Hill)	2·05
Kruis River	1·84
Uitenhage (Gaol)	1·47
Do. (Park)	1·25
Do. (Inggs)	1·40
Armadale (Blue Cliff)	1·91
Dunbrody	—
Port Elizabeth (Harbour)	0·96
Do. (The Slip)	1·18
Do. (Walmer Heights)	1·57
Shark's River (Nursery)	1·24
Do. (Convict Station)	—
Tankatara	—
Centlivres	1·55
Potteberg	1·40
Edinburgh (Knysna)	3·62
Gamtoos Station	1·78

V. SOUTHERN KARROO:

Verkeerde Vlei	—
Bok River	—
Triangle	—
Touws River	—
Do (D.E. Office)	—
Pietermeintjes	0·43
Grootfontein	—
Ladismith	0·71
Amalienstein	0·59
Seven Weeks Poort	—
Calitzdorp	0·30
Oudtshoorn	0·37
Vlaakte Plaats	0·88
Uniondale	0·96
Kleinpoort	—
Glenconnor	—
Rust en Vrede	—

VI. WEST CENTRAL KARROO:

	Inches.
Matjesfontein	—
Laingsburg	—
Prince Albert Road	—
Fraserburg Road	—
Prince Albert	0·13
Zwartberg Pass	—
Booi's Kraal (Beaufort West)	—
Beaufort West (Gaol)	0·00
Dunedin	0·17
Nel's Poort	0·15
Camfers Kraal	—
Lower Nel's Poort	—
Krom River	0·20
Roosplaats	0·16
Baaken's Rug	0·22
Willowmore	0·60
Rietfontein	—
Steytlerville	1·12

VII. EAST CENTRAL KARROO:

Buffels Kloof	0·49
Aberdeen (Gaol)	—
Do. (Bedford)	—
Corndale	—
Aberdeen Road	0·81
Klipplaat	1·39
Winterhoek	0·76
Klipdrift	—
Kendrew (Holmes)	0·89
Kendrew	—
Graaff-Reinet (Gaol)	0·72
Do. (Eng. Yard)	0·70
Do. (College)	—
New Bethesda	0·75
Roodebloem	0·63
Glen Harry	0·88
Wellwood	0·69
Do. (Mountain)	—
Bloemhof	0·82
Jansenville	0·71
Patrysfontein	—
Bethesda Road	—
Afrikander's Kloof	—
Roode Hoogte	—
Toegedacht	—
Klipfontein	0·43
Cranemere	—
Pearston	—
Darlington	—
Walsingham	—
Arundale	—
Doornbosh (Zwagershoek)	—
Middlewater	0·88
Somerset East (Gaol)	2·55
Do. do. (College)	—
Longhope	—
Cookhouse	—
Middleton	—
Spitzkop (Graaff-Reinet)	0·72
Bruintjes Hoogte	—
Grobbelaars Kraal	0·47
Zeekoe River	0·69

VIII. NORTHERN KARROO:

Calvinia	0·12
Middlepost	—

VIII. NORTHERN KARROO (*continued*):	*Inches.*
Brandvlei	—
Onderste Doorns	—
Sutherland	0·24
Fraserburg	0·00
Scorpions Drift	—
Rheboksfontein	—
Klein Vlei	—
Carnarvon	0·93
Loxton	—
Beyersfontein	—
Wagenaars Kraal	—
Brakfontein	0·24
Victoria West	0·38
Omdraais Vlei	—
Doorskuilen	—
Britstown	0·71
Wildebeestkooij	0·65
Murraysburg	—
De Kruis (Murraysburg)	0·65
Richmond	0·56
De Aar	—
Middlemount	—
Hanover	0·86
Theefontein	0·89, 1·03
Zwagersfontein	—
Philipstown	1·47
Boschfontein	—
Petrusville	0·68
The Willows (Middelburg)	—
Naauwpoort	—
Middelburg (Goal)	—
Do.	—
Do. (Government Farm	—
Jackalsfontein	—
Ezelpoort	—
Plaatberg	—
Grape Vale	—
Ezelfontein	—
Roodepoort	—
Groenkloof	
Vlakfontein	—
Vogelsfontein	—
Plaatfontein	—
Colesberg	0·70
Tafelberg Hall	—
Rietbult (Colesberg Bridge)	—
Fish River	—
Varkenskop	1·07
Culmstock	0·74
Droogefontein	—
Stonehills	—
Cradock (Gaol)	0·54
Witmoss	—
Varsch Vlei	—
Maraisburg	0·65
Steynsburg (Gaol)	0·79
Rietvlei	—
Hillmoor	—
Quaggaskerk	—
Tarkastad	1·38
Do. (Div. Engineer)	—
Drummond Park	0·50
Glen Roy	—
Waverley	1·19
Gaanapan	—
Montagu	—

VIII. NORTHERN KARROO (*continued*):	*Inches.*
Grape Vale	—
Rietfontein (Cradock)	—
Schuilhoek	1·31
Vosberg	0·86
Zwavelfontein	0·89
Holle River (Colesberg)	—
The Meadows (Schoombie)	—
The Lands (Dassiefontein)	0·46
Het Weg Kloof	0·55
Thebus Waters	1·41
Ruightersfontein	1·35
Zoetolie (Richmond)	0·91

IX. NORTHERN BORDER:	
Pella	0·00
The Halt	—
Keimoes	—
Kenhardt	0·12
Upington	0·31
Trooilapspan	—
Van Wyksvlei	—
Prieska	0·61
New Year's Kraal	0·39
Dunmurry	1·33
Karree Kloof	0·60
Griquatown	0·50
Campbell	—
Douglas	—
Avoca (Herbert)	—
Hopetown	0·74
Orange River	—
Newlands (Barkly West)	0·73
Barkly West	0·62
Bellsbank	—
Kimberley (Gaol)	1·19
Do. Stepheus	—
Strydenburg	0·52

X. SOUTH-EAST:	
Melrose (Div. Bedford)	1·64
Dagga Boer	0·58
Fairholt	—
Lynedoch	0·89
Alicedale	2·64
Cheviot Fells	1·31
Bedford (Gaol)	2·94
Do. (Hall)	2·72
Sydney's Hope	—
Cullendale	1·66
Adelaide	1·41
Atherstone	3·99
Alexandria	1·61
Salem	—
Fort Fordyce	1·80
Fountain Head	—
Grahamstown (Gaol)	1·77
Do.	—
Heatherton Towers	1·48
Sunnyside	—
Vischgat	—
Fort Beaufort	1·26
Katberg	2·80
Balfour	—
Seymour	1·80

X. SOUTH-EAST (*continued*):

Station	*Inches.*
Glencairn	2·33
Alice	—
Lovedale	1·46
Port Alfred	1·19
Hogsback	3·55
Peddie	1·03
Exwell Park	—
Keiskamma Hoek	2·13
Cathcart (Gaol)	2·71
Cathcart (Foreman)	2·83
Cathcart	2·70
Thaba N'doda	2·52
Evelyn Valley	6·78
Crawley	1·60
Thomas River	—
Perie Forest	—
Forestbourne	—
Isidenge	3·21
Kologha	2·76
Kingwilliamstown (Gaol)	1·42
Do. (Dr. Egan)	—
Stutterheim (Wylde)	2·40
Do. (Beste)	—
Fort Cunynghame	2·80
Dohne	—
Kubusie	2 70
Quacu	1·31
Blaney	0·55
Kei Road	—
Berlin	—
Bolo	1·24
Fort Jackson	—
Prospect Farm (Komgha)	7·10
Komgha (Gaol)	1·27
Chiselhurst	1·02
East London West	—
East London East	—
Cata	2·26
Wolf Ridge	4·03
Dontsah	1·96
Mount Coke	—
Blackwoods	—
Albert Vale (Near Bedford)	1·31
Huxley Farm	1·92
Insileni (K.W.R.)	2·07
Woodlands (Fish River Rand)	1·30

XI NORTH-EAST:

Station	*Inches.*
Venterstad	1·02
Mooifontein	1·22
Burnley (Cyphergat)	—
Burghersdorp (Gaol)	0·44
Ellesmere	0·67
Molteno	—
Lyndene	0·56
Cyphergat	—
Broughton	0·81
Thibet Park	—
Sterkstroom (Station)	—
Do. (Gaol)	0·79
Rocklands	0·66
Aliwal North (Gaol)	1·00
Do. do. (Brown)	—
Do. do. (Dist. Engineer)	—
Buffelsfontein	—

XI. NORTH-EAST (*continued*):

Station	*Inches.*
Hex's Plantation	—
Poplar Grove	—
Carnarvon Farm	0·51
Halseton	—
Jamestown	1·65
Whittlesea	1·18
Queenstown (Gaol)	0·90
Do. (Beswick)	—
Rietfontein (Aliwal North)	—
Middlecourt	—
Dordrecht	0·85
Tylden	—
Nooitgedacht	—
Herschel	1·05
Lady Grey	1·94
Lauriston	—
Lady Frere	0·29
Contest (near Bolotwa)	0·39
Sterkspruit	—
Doornkop	—
Avoca (Barkly East)	—
Keilands	0·76
Palmietfontein	—
Barkly East	1·18
Blikana	0·71
Glenlyon	—
Rhodes	—
Gateshead	—
Cliftonvale	0·61
Albert Junction	—
Queenstown (District Engineer's Office)	—
Hughenden	0·46
Glenwallace	—
Indwe (Collieries)	1·24
Bensonvale Inst. (Herschel)	—
Cathcart (Queenstown)	—
Royal (Div. Albert)	—
Sunnymeade (Div. Albert)	0·78
Clifton (Sterks)	0·47
Strydpoort	1·36

XII. KAFFRARIA:

Station	Inches
Ida (Xalanga)	0·86
Slaate (Xalanga)	0·64
Cofimvaba	0·65
Tsomo	—
N'qamakwe	1·88
Main	0·61
Engcobo	0·91
Butterworth	1·35
Woodcliff	2·53
Kentani	1·76
Maclear	2·42
Idutywa	1·17
Bazeya	—
Willowvale	2·33
Mount Fletcher	1·51
Somerville (Tsolo)	1·80
Elliotdale	1·78
M'qanduli	—
Matatiele	—
Umtata	0·67
Cwebe	1·74
Tabankulu	1·63

XII. KAFFRARIA (*continued*):	*Inches.*
Mount Ayliff	—
Kokstad	1·10
Do. (The Willows)	1·40
Seteba	0·55
Flagstaff	2·71
Insikeni	3·83
Port St. Johns	2·74
Kilrush (Sneezewood)	—
Umzimkulu	1·31
Mandileni	—
Wanstead	—
Cedarville	—
Maclear (Station)	2·59
Umzimkulu (Strachan)	1·38
Lusikisiki	1·82
Elton Grange	0·32

XIII. BASUTOLAND:	
Mafeking	—
Mohalies Hoek	1·97
Maseru	1·29
Teyateyaneng (Berea)	1·38
Moyeni Quthing	—
Qacha's Nek	2·66
Leribe	—
Butha Buthe	—

XIV. ORANGE RIVER COLONY:	*Inches.*
Bloemfontein	—

XV. NATAL:	
Durban (Observatory)	—

XVI. BECHUANALAND:	
Taungs	1·01
Vryburg	0·69
Mafeking	1·45
Setlagoli	1·32
Kuruman	0·58
Zwartlaagte	1·36
Nottinghame	1·59
Mosilibitsani	0·57
Armadillo Creek	2·25

XVII. RHODESIA:	
Hopefountain	2·02
Rhodes' Matopo Park	1·45

XVIII. DAMARALAND:	
Walfish Bay	—

Western Province Agricultural Society Third Egg-Laying Competition.

(*Commenced 1st May,* 1910—*To finish 30th April,* 1911.) (*Four Birds to a Pen.*)

Record for December, 1910, and Totals to end of December, 1910.

Pen No.	Owner.	Breed.	Record for Month.			Total to Date.			Position to date.
			Eggs.	Weight.		Eggs.	Weight.		
				oz.	dwts.		oz.	dwts.	
1	W. P. Cowan ..	White Leghorns (English)	46	88	10	337	623	5	9
2	B. Kauffmann ..	Brown Leghorns ..	36	67	3	328	601	10	11
3	K. B. Jobling ..	White Wyandottes..	37	72	5	282	542	12	14
4	R. G. Hudson ..	Brown Leghorns ..	32	65	1	205	411	1	28
5	K. B. Jobling ..	White Leghorns (Australian-American)	39	74	15	304	581	12	12
6	S. H. West ..	White Leghorns (American)	49	102	9	325	657	5	7
7	A. F. Rackstraw	White Wyandottes..	18	40	3	143	295	14	48
8	J. W. Wright ..	White Wyandottes ..	24	46	1	198	374	14	34
9	R. W. Hazell ..	Columbian (1 dead)	22	44	4	103	204	10	52
10	S. A. West ..	White Leghorns (American)	25	49	4	245	484	11	15
11	C. H. v. Breda ..	White Leghorns (American)	26	55	4	200	409	8	29
12	S. C. Skaife ..	White Wyandottes	23	42	9	236	431	1	24
13	R. W. Hazell ..	White Orpingtons ..	15	29	11	170	348	9	39
14	Clif. Hoole ..	Buff Leghorns ..	21	43	1	235	451	11	19
15	F. T. Hobbs	Silver Wyandottes ..	26	47	13	181	329	8	43
16	B. Kauffmann ..	Black Minorcas(1 dead)	13	29	15	130	286	13	49
17	S. C. Boyes ..	White Leghorns (American)	58	115	5	402	791	10	2
18	A. Aitken ..	White Leghorns (American)	64	122	15	378	722	2	5
19	F. Muller ..	Black Minorcas ..	16	34	6	156	320	13	45
20	B. Kauffmann ..	Brown Leghorns ..	27	49	10	235	420	3	25
21	R. W. Hazell ..	White Wyandottes (1 dead)	14	29	0	149	299	2	47
22	J. P. Seabrook ..	Blue Andalusians ..	34	69	3	215	436	2	23
23	S. A. West ..	Red Sussex	33	62	2	176	327	2	44
24	R. W. Hazell ..	White Wyandottes..	28	56	4	230	454	15	17
25	J. Leibbrandt ..	White Wyandottes ..	35	72	3	213	418	4	26
26	R. G. Hudson ..	Black Wyandottes ..	18	34	1	237	449	2	20
27	H. H. Bright ..	White Leghorns (English)	24	49	3	203	400	14	30
28	O. C. Macpherson	White Leghorns (American)	20	40	0	196	389	5	31
29	H. H. Bright ..	Black Leghorns (1 dead)	28	53	10	210	379	5	33
30	H. H. Bright ..	White Leghorns (English)	25	50	11	182	363	3	36
31	C. H. v. Breda ..	White Leghorns (American)	35	66	0	335	622	8	10
32	S. Smith ..	Brown Leghorns (3 dead)	4	8	3	265	483	3	16
33	F. T. Hobbs ..	Silver Wyandottes ..	6	11	8	113	212	13	51
34	A. Keppie ..	White Wyandottes ..	28	53	5	248	452	5	18

WESTERN PROVINCE AGRICULTURAL SOCIETY THIRD EGG-LAYING COMPETITION—(*continued*).

Record for December, 1910, and Totals to end of December, 1910.

Pen No.	Owner.	Breed.	Record for Month.			Total to Date.			Position to date.
			Eggs.	Weight.		Eggs.	Weight.		
				oz.	dwts.		oz.	dwts.	
35	C. H. v. Breda ..	White Leghorns (Australian)	49	87	13	485	860	11	1
36	S. Smith ..	White Leghorns (Danish-American)	60	115	15	385	719	4	6
37	F. T. Hobbs ..	Silver Wyandottes	14	25	7	185	332	6	42
38	Vacant.								
39	C. H. v. Breda ..	White Leghorns (Australian-American)	41	77	15	421	767	13	3
40	R. J. Williams ..	Black Minorcas (2 dead)	16	38	7	71	169	8	53
41	F. Muller ..	Black Minorcas (1 dead)	26	52	8	168	340	15	40
42	C. H. v. Breda ..	White Leghorns (American)	21	47	12	202	440	2	21
43	I. E. Wright ..	Brown Leghorns (2 dead)	16	34	10	128	259	10	50
44	C. H. v. Breda ..	White Leghorns (American-Australian)	39	78	2	380	732	13	4
45	B. Kauffmann ..	White Leghorns (English)	44	88	4	184	361	8	37
46	S. A. West ..	Brown Leghorns ..	39	75	2	202	386	14	32
47	R. W. Hazell ..	Black Orpington ..	19	38	0	193	373	15	35
48	C. W. Pilkington	Rhode Island Reds..	38	86	13	156	340	4	41
49	S. Smith ..	Brown Leghorns (2 dead)	23	45	8	198	358	9	38
50	C. H. v. Breda ..	White Leghorns (Australian-American) (1 dead)	35	61	2	370	650	0	8
51	K. B. Jobling ..	White Leghorns (Australian-American) (1 dead)	37	74	13	217	416	6	27
52	S. A. West ..	Brown Leghorns (1 dead)	19	35	13	165	314	9	46
53	N. Cole	Brown Leghorns ..	26	49	8	281	543	7	13
54	K. B. Jobling ..	White Leghorns (American)	38	76	12	226	437	7	22

Agricultural Show Dates, 1911.

CAPE PROVINCE.

Paarl.—26th January.
Stellenbosch.—2nd February.
Bredasdorp.—9th February.
Robertson and Montagu.—14th and 15th February.
Worcester.—22nd and 23rd February.
Queenstown.—22nd and 23rd February.
Beaufort West.—23rd and 24th February.
Ceres.—Middle of February to beginning of March.
Malmesbury.—23rd February.
Rosebank (Western Province).—28th February, 1st, 2nd, and 3rd March.
Aliwal North.—28th February and 1st March.
Graaff-Reinet.—1st and 2nd March.
Cathcart.—1st March.
Wodehouse (Dordrecht).—7th and 8th March.
Middelburg.—7th and 8th March.
Humansdorp.—8th and 9th March.
Caledon.—9th March.
Bathurst.—9th and 10th March.
Somerset East.—10th March.
Kingwilliamstown.—10th and 11th March.
Cradock.—14th and 15th March.
Molteno.—15th and 16th March.
Grahamstown.—16th and 17th March.
Port Elizabeth.—21st to 24th March.
Oudtshoorn.—28th and 29th March.

TRANSVAAL PROVINCE.

Middelburg.—14th and 15th February.
Amersfoort.—21st February.
Carolina.—28th February.
Bethal.—2nd March.
Ermelo.—9th March.
Volksrust.—15th and 16th March.
Standerton.—22nd March.
Wolmaransstad.—5th April.
Heidelberg.—12th and 13th April.
Johannesburg.—19th to 22nd April.
Potchefstroom.
Schweizer Renecke
Bloemhof
Christiana } Combined.—3rd May.
Waterberg.—10th May.
Zoutpansberg.—17th May.
Rustenburg.—24th and 25th May.
Pretoria.—30th May to 1st June.
Barberton.—23rd June.

ORANGE FREE STATE PROVINCE.

Wepener.—8th and 9th February.
Smithfield.—15th and 16th February.
Lindley.—21st and 22nd February.
Rouxville.—22nd and 23rd February.
Vrede.—1st and 2nd March.
Bethulie and Philippolis.—2nd March.
Kroonstad.—1st and 2nd March.
Ladybrand.—1st and 2nd March.
Frankfort.—7th and 8th March.
Jagersfontein and Fauresmith.—7th and 8th March.
Senekal.—7th and 8th March.
Thaba 'Nchu.—8th and 9th March.
Harrismith.—8th and 9th March.
Edenburg.—15th and 16th March.
Bethlehem.—15th and 16th March.
Boshof.—15th and 16th March.
Winburg.—21st and 22nd March.
Heilbron.—22nd and 23rd March.
Ficksburg.—22nd March.
Bloemfontein.—28th, 29th, and 30th March.

NATAL PROVINCE.

Pietermaritzburg.—29th and 30th June and 1st July.
Durban.—5th, 6th, and 7th July.
Umzinto.—29th June.
Weenen (Estcourt).—22nd and 23rd June.
Ladysmith.—15th and 16th June.

Annual Sale of Government Stock, Experimental Farm, Potchefstroom, 8th October, 1910.

LIST OF PURCHASERS, WITH ADDRESSES.

Lot.	Purchasers.	Stock Purchased.	Price. £	s.	d.	Total. £	s.	d.
2	R. G. Antrobus, Pietersburg	1 Large white Yorkshire boar, D.O.A. 170 P.	5	5	0	5	5	0
3	J. W. Blockley, Maraisburg	1 Large white Yorkshire boar, D.O.A. 173P.	5	5	0			
4		1 Large white Yorkshire boar, D.O.A. 174P.	4	4	0			
7		1 Large white Yorkshire boar, D.O.A. 177P.	3	3	0			
8		1 Large white Yorkshire boar, D.O.A. 178P.	3	13	6	16	5	6
4	General Beyers, Pretoria	1 Fries bull, D.O.A. 9P. ..	91	17	6	91	17	6
4	Mr. Blane, Ermelo ..	1 Tasmanian ram, D.O.A. 73P.	8	8	0			
7		1 Rambouillet Merino ram, D.O.A. 27S.	19	19	0			
8		1 Rambouillet Merino ram, D.O.A. 35S.	16	16	0			
9		1 Rambouillet Merino ram, D.O.A. 38S.	18	18	0	64	1	0
27	J. A. van der Byl, Caledon, C.C.	1 Suffolk Down ram, D.O.A. 102P.	4	4	0	4	4	0
	L. Biccard, Box 4402, Johannesburg	1 Large black boar, D.O.A. 175P.	7	17	6	7	17	6
20	J. Cellier, Boshof ..	1 Suffolk Down ram, D.O.A. 14S.	10	10	0			
7	Dr. Davis, Ermelo ..	1 Fries bull, D.O.A. 12P. ..	63	0	0			
10		1 Rambouillet Merino ram, D.O.A. 41S.	21	0	0			
11		1 Rambouillet Merino ram, D.O.A. 42S.	26	5	0	110	5	0
32	Percy Dyer, Welverdiend	1 Sussex bull, D.O.A. 26P...	44	12	6			
33		1 Sussex bull, D.O.A. 27P...	42	0	0	86	12	6
36	T. Douglas, Johannesburg	1 Sussex bull, D.O.A. 30P.....	21	0	0	21	0	0
40	M. Durr, Potchefstroom..	1 Afrikander bull, D.O.A. 10P.	13	13	0	13	13	0
32	C. M. Devenish, Pietersburg	1 Large black boar, D.O.A. 178P.	7	7	0	7	7	0
33	H. Dell, Davel	1 Large black boar, D.O.A. 179P.	7	7	0			
35		1 Large black sow, D.O.A. 185P.	7	7	0	14	14	0
15	G. W. Eaton, Benoni ..	1 Lincoln red Shorthorn bull, D.O.A. 25P.	52	10	0	52	10	0
1	G. Engelbrecht, Wolmaransstad	1 Tasmanian Merino ram, D.O.A. 159	2	2	0	2	2	0
		Forward..			£	508	4	0

LIST OF PURCHASERS, WITH ADDRESSES—(*continued*).

Lot.	Purchasers.	Stock Purchased.	Price. £ s. d.	Total. £ s. d.
		Forward ..		508 4 0
23	Captain Edwards, Pietersburg	1 Large black boar, D.O.A. 167P.	7 7 0	7 7 0
5	W. Fleming, Potchefstroom	1 Fries bull, D.O.A. 10P. ..	63 0 0	
3		1 Tasmanian Merino ram, D.O.A. 21	8 18 6	
13		1 Suffolk Down ram, D.O.A. 7S.	7 7 0	
15		1 Suffolk Down ram, D.O.A. 9S.	5 5 0	
18		1 Suffolk Down ram, D.O.A. 12S.	5 15 6	90 6 0
10	Harold Fry, Box 46, Johannesburg	1 Berkshire boar, D.O.A. 73P.	6 6 0	6 6 0
31	Fuller & Ohlsson, Toise River, Cathcart, C.C.	1 Large black boar, D.O.A. 177P.	6 6 0	6 6 0
11	M. Granger, Brugspruit	1 Ayrshire bull, D.O.A. 28P.	31 10 0	31 10 0
3	J. K. Hannan, Lydenburg	1 Fries bull, D.O.A. 8P. ..	105 0 0	
9		1 Yorkshire boar, D.O.A. 72P.	5 5 0	
12		1 Berkshire sow, D.O.A. 66P.	7 17 0	
13		1 Berkshire sow, D.O.A. 67P.	12 1 6	
24		1 Large black boar, D.O.A. 173P.	8 8 0	
39		1 Large black sow, D.O.A. 189P.	9 9 0	
43		1 Large black boar, D.O.A. 175P.	11 0 6	159 1 6
19	Mr. Howard, Johannesburg	1 Shorthorn (Coates) bull, D.O.A. 4S.	55 2 6	55 2 6
25	Geo. Heys, Machadodorp	1 Hereford bull, D.O.A. 25P.	73 10 0	
31		1 Sussex bull, D.O.A. 25P...	57 15 0	
2		1 Tasmanian Merino ram, D.O.A. 11	23 12 6	
5		1 Tasmanian Merino ram, D.O.A. 96	13 13 0	
6		1 Tasmanian Merino ram, D.O.A. 84	25 4 0	193 14 6
12	W. Hosken, Johannesburg	1 Suffolk Down ram, D.O.A. 6S.	6 6 0	
19		1 Suffolk Down ram, D.O.A. 13S.	3 13 6	9 19 6
14	Neggett & Ovens, Ventersdorp	1 Suffolk Down ram, D.O.A. 8S.	5 5 0	5 5 0
25	Hardwick & Scrambler, Rustenburg	1 Suffolk Down ram, D.O.A. 23S.	12 12 0	12 12 0
34	H. G. Howse, Box 216, Boksburg	1 Large black boar, D.O.A. 181P.	7 17 6	7 17 6
21	E. A. Johnston, Box 8, Knights	1 Shorthorn (Coates) bull, D.O.A. 6S.	36 15 0	36 15 0
35	Jooste & Bryant, Johannesburg	1 Sussex bull, D.O.A. 29P...	31 10 0	31 10 0
39	A. J. Kerslake, Val Station	1 Afrikander bull, D.O.A. 7P.	49 17 6	49 17 6
		Forward..	**£**	**1211 14 0**

LIST OF PURCHASERS, WITH ADDRESSES—(*continued*).

Lot.	Purchasers.	Stock Purchased.	Price.	Total.
			£ s. d.	£ s. d.
		Forward ..		1211 14 0
17	F. Konig, Wolmaransstad	1 Suffolk Down ram, D.O.A. 11S.	4 4 0	
28		1 Suffolk Down ram, D.O.A. 106P.	3 3 0	
29		1 Suffolk Down ram, D.O.A. 107P.	2 2 0	9 9 0
12	Leper Asylum, Pretoria ..	1 Ayrshire bull, D.O.A. 29P.	52 10 0	52 10 0
37	C. Lambert, Standerton	1 Sussex bull, D.O.A. 31P.	26 5 0	26 5 0
11	T. H. Lawrence, Nelspruit	1 Berkshire boar, D.O.A. 74P.	5 5 0	5 5 0
25	Lunatic Asylum, Pretoria	1 Large black boar, D.O.A. 174P.	9 19 6	
26		1 Large black sow, D.O.A. 180P.	7 7 0	
28		1 Large black sow, D.O.A. 182P.	6 16 6	24 3 0
16	F. Mockford, Pietersburg	1 Lincoln Red Shorthorn bull, D.O.A. 27P.	44 2 0	44 2 0
27	W. A. McLaren, Vereeniging	1 Hereford bull, D.O.A. 27P.	55 2 6	
38		1 Large black sow, D.O.A. 188P.	6 16 6	
41		1 Large black sow, D.O.A. 191P.	7 17 6	69 16 6
38	A. McLagen, Potchefstroom	1 Sussex bull, D.O.A. 32P...	24 3 0	24 3 0
14	A. M. Mostert, Box 1954, Johannesburg	1 Berkshire sow, D.O.A. 68P.	6 16 6	
15		1 Berkshire boar, D.O.A. 76P.	7 17 6	
20		1 Berkshire sow, D.O.A. 72P.	6 16 6	21 10 6
16	Captain Madge, Johannesburg	1 Berkshire boar, D.O.A. 77P.	8 8 0	8 8 0
6	J. C. Nugteren, High Court Buildings, Pretoria	1 Fries bull, D.O.A. 11P. ..	70 17 6	70 17 6
44	J. Price, Roodekop ..	1 Large black sow, D.O.A. 176P.	7 17 6	
45		1 Large black sow, D.O.A. 177P.	9 9 0	
46		1 Large black sow, D.O.A. 178P.	7 17 6	25 4 0
8	J. Quillian, Jeppestown ..	1 Fries bull, D.O.A. 13P. ..	57 15 0	57 15 0
2	W. Rood, Ermelo ..	1 Fries bull, D.O.A. 10S. ..	57 15 0	57 15 0
20	T. Ross, Pietersburg ..	1 Shorthorn (Coates) bull, D.O.A. 5S.	42 0 0	42 0 0
		Forward ..	£	1750 17 6

LIST OF PURCHASERS, WITH ADDRESSES—(*continued*).

Lot.	Purchasers.	Stock Purchased.	Price.	Total.
			£ s. d.	£ s. d.
		Forward ..		1730 17 6
22	J. Roy, Johannesburg ..	1 Shorthorn (Coates) bull, D.O.A. 7S.	44 12 6	
29		1 Hereford bull, D.O.A. 29P.	35 14 0	80 6 6
26	Rawbank Stock Farm, Waterberg	1 Hereford bull, D.O.A. 18S.	31 10 0	
28		1 Hereford bull, D.O.A. 28P.	52 10 0	84 0 0
30	Setterfield Bros., Bandoliers Kop, Zoutpansberg	1 Sussex bull, D.O.A. 33P...	52 10 0	52 10 0
1	Staunton & Co., Box 350, Johannesburg	1 Large white Yorkshire boar, D.O.A. 168P.	8 8 0	8 8 0
17	Senekal Piggery Co., Box 49, Senekal	1 Berkshire boar, D.O.A. 78P.	10 10 0	
18		1 Berkshire sow, D.O.A. 70P.	7 7 0	
29		1 Large black sow, D.O.A. 183P.	7 7 0	
30		1 Large black sow, D.O.A. 184P.	6 16 6	
36		1 Large black sow, D.O.A. 186P.	5 5 0	
37		1 Large black sow, D.O.A. 187P.	4 14 6	
40		1 Large black sow, D.O.A. 190P.	8 8 0	
47		1 Large black sow, D.O.A. 179P.	7 17 6	58 5 6
10	W. P. Taylor	1 Ayrshire bull, D.O.A. 26P...	73 10 0	73 10 0
24	J. J. Theron, Rietfontein, Koster	1 Hereford bull, D.O.A. 24P.	42 0 0	42 0 0
34	J. E. Travers, Pilgrims Rest	1 Sussex bull, D.O.A. 28P...	34 2 6	34 2 6
27	F. Tucker, Birchleigh ..	1 Large black sow, D.O.A. 181P.	8 8 0	8 8 0
17	P. P. Verveen, Pietersburg	1 Lincoln Red Shorthorn bull, D.O.A. 28P.	57 15 0	57 15 0
1	R. Wishardt, Holmdene	1 Clydesdale stallion ..	49 17 6	
9		1 Ayrshire bull, D.O.A. 31P.	31 10 0	81 7 6
13	Witbank Collieries, Witbank	1 Ayrshire bull, D.O.A. 30P.	57 15 0	
19		1 Berkshire sow, D.O.A. 71P.	6 16 6	
22		1 Berkshire sow, D.O.A. 74P.	7 7 0	71 18 6
21	Hon. De Waal, Wolmaransstad	1 Suffolk Down ram, D.O.A. 16S.	3 13 6	
26		1 Suffolk Down ram, D.O.A. 101P.	2 2 0	5 15 6
		Forward ..	£	2409 4 6

LIST OF PURCHASERS, WITH ADDRESSES—(*continued*).

Lot.	Purchasers.	Stock Purchased.	Price.	Total.
			£ s. d.	£ s. d.
		Forward ..		2409 4 6
22	Mr. Williamson, Heidelberg	1 Suffolk Down ram, D.O.A. 20S.	3 13 6	
23		1 Suffolk Down ram, D.O.A. 21S.	3 13 6	
24		1 Suffolk Down ram, D.O.A. 22S.	4 4 0	
33		Shropshire Down ram and 4 Ewes	10 10 0	22 1 0
30	H. de Wet, Robertson, C.C.	1 Suffolk Down ram, D.O.A. 108P.	2 12 6	
31		1 Suffolk Down ram, D.O.A. 112P.	5 5 0	
32		1 Suffolk Down ram, D.O.A. 114P.	3 13 6	11 11 0
5	F. W. Wilkin, Potchefstroom	1 Large white Yorkshire boar, D.O.A. 175P.	2 2 0	2 2 0
			£	2444 18 6
		Poultry Division		50 18 0
			£	2495 16 6

AVERAGES—CATTLE AND HORSES.

	No. sold. Bred on Farm.	No. sold. Imported.	Highest Price.	Lowest Price.	Average Price.	Last Year's Average Price.	Total, 1910.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Clydesdale stallion ..	1	—	—	—	—	100 16 0	49 17 6
Fries bulls	7	—	105 0 0	57 15 0	72 15 0	80 6 6	509 5 0
Ayrshire bulls ..	—	1	—	—	—	—	31 10 0
Ayrshire bulls ..	4	—	73 10 0	31 10 0	53 16 3	60 12 9	215 5 0
Lincoln red Shorthorn bulls	3	—	57 15 0	44 2 0	51 9 0	68 12 0	154 7 0
Shorthorn (Coates) bulls	4	—	55 2 6	36 15 0	44 12 6	57 15 0	178 10 0
Hereford bulls ..	6	—	73 10 0	31 10 0	48 7 9	57 4 6	290 6 6
Sussex bulls ..	9	—	57 15 0	21 0 0	37 2 0	52 11 9	333 18 0
Afrikander bulls ..	2	—	49 17 6	13 13 0	31 15 3	43 7 7	63 10 6
					Total	£	1826 9 6

AVERAGES—SHEEP.

	No. sold. Bred on Farm.	No. sold. Imported.	Highest Price. £ s. d.	Lowest Price. £ s. d.	Average Price. £ s. d.	Last Year's Average Price. £ s. d.	Total, 1910. £ s. d.
Tasmanian Merino rams	6	—	23 12 6	2 2 0	13 13 0	—	81 18 0
Rambouillet rams ..	5	—	26 5 0	18 18 0	20 11 7	—	102 18 0
Suffolk rams ..	20	—	12 12 0	2 2 0	4 19 3	—	99 4 6
Shropshire ram ..	1	—	—	—	—	—	10 10 0
Shropshire ewes ..	4	—	—	—	—	—	—
					Total	£	294 10 6

PIGS.

Large white Yorkshire	7	—	8 8 0	2 2 0	4 11 6	7 1 9	32 0 6
Berkshire	13	—	12 1 6	5 5 0	7 11 10	4 16 4	98 14 0
Large black ..	25	—	11 0 6	4 14 6	7 14 7	4 17 4	193 4 0
					Total	£	323 18 6

SUMMARY—AVERAGE PRICES.

	Average Price, 1905. £ s. d.	Average Price, 1906. £ s. d.	Average Price, 1907. £ s. d.	Average Price, 1908. £ s. d.	Average Price, 1909. £ s. d.	Average Price, 1910. £ s. d.
Horse—						
Clydesdale stallion	—	—	—	—	100 16 0	49 17 6
Cattle—						
Bulls, imported ..	40 13 9	45 13 6	42 0 0	25 14 6	—	31 10 0
Bulls, bred on farm	35 7 7	42 11 6	57 10 4	48 3 8	57 19 9	49 17 3
Sheep—						
Shropshire rams and ewes	—	—	—	—	—	2 2 0
Suffolk Down rams, imported	—	—	—	10 17 5¼	—	—
Suffolk Down rams, bred on farm	—	—	—	—	—	4 19 3
Rambouillet Merino rams, bred at Standerton and Ermelo	—	—	—	8 10 0	—	20 11 7
Rambouillet Merino rams, imported	—	—	—	9 9 0	—	—
Tasmanian Merino rams	—	—	—	—	—	13 13 0
Pigs—						
Boars and sows, bred on farm	—	4 7 9	3 9 3½	4 3 5	4 18 6	7 3 11
Boars and sows, imported	—	—	—	9 9 0	8 8 0	—

DISTRICT SUMMARY.

District.	Stock Purchased.					Total Value.		
	Stallion.	Bulls.	Rams.	Ewes.	Pigs, Boars, and Sows.	£	s.	d.
Boshof, O.F.S.	—	—	1	—	—	10	10	0
Carolina	—	2	—	—	—	80	6	6
Cathcart, Cape	—	—	—		1	6	6	0
Ermelo	—	2	6	—	2	246	15	0
Heidelberg	—	2	4	4	2	144	7	6
Lydenburg	—	1	—	—	6	159	1	6
Middelburg (Transvaal)	—	2	—	—	2	103	8	6
Potchefstroom	—	6	1	—	1	239	15	6
Pretoria	—	5	4	—	3	437	6	6
Robertson, Cape	—	—	3	—	—	11	11	0
Rustenburg	—	1	1	—	—	54	12	0
Senekal, O.F.S.	—	—	—	—	8	58	5	6
Standerton	1	4	4	—	—	247	16	0
Waterberg	—	4	—	—	1	175	17	6
Witwatersrand	—	4	2	—	16	287	17	0
Wolmaransstad	—	—	6	—	—	17	6	6
Zoutpansberg	—	3	—	—	3	163	16	0
TOTAL	1	36	32	4	45	£2444	18	6

The Agricultural Journal

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Subscriptions.

The present issue is being distributed on the old free lists throughout the country, but after this delivery will be discontinued to those who have not paid the sum of 2s. for the year's subscription. This matter is mentioned again as some may have overlooked it, and others again may have received the last issue rather late owing to pressure in its production. It is to be hoped that no one will neglect this notice and be afterwards disappointed at the non-receipt of the *Agricultural Journal*. All subscriptions *must* be in the hands of the Government Printer, Pretoria, by the 31st of this month (March) at the very latest, otherwise the names will be struck off the mailing lists without further notice.

Agricultural Organization.

The Transvaal Agricultural Union and the later-formed "Organisatie Vereniging" are to be heartily congratulated upon the results of the recent congress held at Pretoria. As is well known, the Agricultural Union has for some years past done excellent work in the interests of agriculture. Of late, however, a feeling grew up among the bulk of the farmers that the interests of the "working farmer" were not given that share of attention which their importance deserved. This feeling developed to such an extent that the "Organisatie Vereniging" was formed, developed rapidly, and was soon in a flourishing position. We thus had the two organizations working in the same field, and, though there may have been some rivalry in certain directions, each seems to have largely worked in the same direction as the other. The ultimate end of such a set of conditions was obvious from the beginning. It only needed approaching in the right spirit and fusion was bound to follow. This has now happened, and we wish the combined body every success in the future. There may be little troubles—as these are experienced in the best of regulated families—but such should never cause any deviation from the path of union which has been so auspiciously begun. The great point gained is that the two bodies have agreed upon complete amalgamation, showing that there is nò real diversity of interest.

Merino Sheep Show for South Africa.

The letter which appears in the correspondence pages this month from Mr. R. Pell Edmonds, a prominent breeder of merino sheep in the Cape Province, should attract some attention. Mr. Edmonds argues—and we believe he will be supported by a very large number

of sheep-breeders—that the time has arrived when the premier cultural industry of South Africa, namely that of the production of fine wool, should receive more direct attention than has hitherto been the case. In the clash of rival claims we are apt to overlook what this country owes to the merino sheep, and, what is the more striking, to entirely fail to grasp the importance of this industry in the past and its enormous prospects for the future. Little is gained by verbal contrasts, otherwise a great deal might be said on this subject. Let it suffice for the moment to heartily endorse the suggestion put forward by Mr. Edmonds. That a Merino Sheep Show, held for the whole of South Africa, could possibly be anything but an advantage to the great wool industry of the country is beyond thinking. It might not, in itself, prove a monetary success at first, but it should be possible to arrange from the start-off for any possible shortfall. The further suggestion that the show should be accompanied by lectures and demonstrations would undoubtedly add to its attractions. The only practical difficulty which seems to lie in the way is one that might possibly arise among certain sections of the breeders themselves. It is open to question whether they would all be prepared to add another important fixture to those already on the list to which they would have to take their valuable stud animals if they desired to keep abreast of the times. In any case the suggestion is well worth serious discussion, and we trust the flockmasters of the country will not hesitate to register their views.

Ostriches in the Transvaal.

Mr. Gerald E. Ainslie, of Les Marais, Pretoria, writes as follows:—I see in your *Journal* for February, 1911, an article on ostriches, which article, I take it, is written from information derived from experiments and farming in the Cape Province, nothing being stated as to methods and attainments derived from ostrich farming in the Transvaal. As our seasons and circumstances are practically contrary to those in the Cape, it would be interesting to those of us who have taken up ostrich farming as a hobby or otherwise in the Transvaal to be informed by the expert, from information obtained by him during his tours of inspection in these parts, what effect the climate, etc., may have on the breeding season up here in relation to that obtaining in the Cape; also what artificial feeding, etc., is needed to produce the best results in plumage and early development of young stock. This latter point is, I feel, a very important one, as I have tested many cases of poultry and find that those birds which are brought to maturity as early as possible after the commencement of the breeding season inevitably produce the best returns in flesh and eggs. Moreover, I find that by feeding young ostriches on artificial food from their earliest stages the birds develop much faster than those allowed to run freely on lucerne, etc., and ultimately, although from the same stock, produce a better and denser feather. In this respect perhaps the ostrich expert might be able to give us a satisfactory statement from experiments as to the advantages (if any) to be derived —from the monetary point of view—from artificial feeding as compared with natural pasturage. One other point which perhaps your department can advise me on is whether lucerne feeding is preferable and more advantageous in the Transvaal to paspalum grass, or any other such food to which an ostrich would readily take?

In connection with the above, Mr. F. Thornton, Ostrich Expert for the Transvaal, supplies the following memorandum:—The article appearing in the February number of the *Union Agricultural Journal* appears to me to be more of a zoological treatise on the ostrich and its feathers than information derived from experiments and farming in the Cape Province. The climatic conditions of a great part of the Cape Province are practically the same as those obtaining in the Transvaal, except perhaps that the rainfall of the Cape Province (that is in the Midlands or Karroo) is spread over the greater part of the year, and there is not such a defined wet and dry season as obtains here. The grazing conditions are totally different as far as natural feed goes. There, at certain times during good seasons, birds can be allowed to graze on the veld when growing quills. Here they have to have a certain amount of artificial feeding always, as birds do not care for grass, and weeds have very little feeding value. I do not think climatic conditions alter the breeding seasons, although we might start birds breeding here a month sooner, say, the beginning of April, and stop the hatching a month earlier, say, the end of November—being 500 miles nearer the Equator.

Artificial feeding (such as grazing on lucerne, etc., and plenty of it) produces marked results in plumage and early development of young stock. I quite agree with the writer that young birds produced at the beginning of the season, when the parent birds are rested, are stronger, and, as a rule, healthier than those hatched at the end, when the parent birds' vitality is reduced; but I do not admit that the first chicks of a season produce better and denser feathers than those hatched later from the same stock, and I have seen no results, either at the Cape or here, to bear out such an assertion. The monetary advantage of artificial feeding over natural pasturage is great. It has been proved that birds producing £3 worth of feathers on good "natural grazing" have advanced to £5 worth on lucerne or rape and mealies. Lucerne is certainly preferable to paspalum for ostrich feed. This point can easily be proved by planting a bed of lucerne and paspalum together in one camp, or lucerne and any other ostrich feed. Place the ostriches in the camp to graze it off, and observe which food they will eat first and how entirely they will finish off the lucerne before eating the other foods.

Mole Crickets.

Mr. Claude Fuller, the Government Entomologist for the Natal Province, has forwarded a copy of a letter which he has dispatched to a correspondent in Eshowe, Zululand, relative to certain insect specimens sent for identification. As the information conveyed in the letter will probably interest many readers of the *Journal*, it is published herewith. Mr. Fuller writes:—The insect specimens sent in company with your letter of the 10th instant are commonly known as "Mole Crickets" *Gryllotalpa* species. These creatures usually frequent damp places near ponds and spruits; and, in view of the fact that your potatoes are growing "in a piece of peaty ground, the head or source of a water-course", it is more because of the site selected for the crop than any other reason that they have played such mischief to the tubers.

This "vicious and ferocious thing", as you describe it, owes what repugnance it has to you to the remarkable modification of its front legs. These are much dilated and shaped for burrowing into the soil, like to a mole in search of food and, in part well designed like a pair of shears, for cutting roots. There is even more than a superficial resemblance between these crickets and the animals whose name they bear, for their eyes are also much reduced, and they live almost entirely underground. Otherwise they are not very dreadful creatures, though their curiously flattened and velvety bodies, their much shortened wing-covers and wonderful forefeet, render them remarkable as insects. Whilst generally speaking, they are truly subterranean, mole crickets come out of the soil at night and not infrequently wing their way to lights.

Little is known of the life histories and habits of our South African mole crickets. Doubtless, however, these differ little from those of their relatives of other countries. The females are said to deposit between two hundred and three hundred eggs, massed in underground chambers, sometimes at a considerable depth below the surface, and the females are credited with watching carefully over their eggs until they hatch, three or four weeks after they are laid. This brooding over eggs by insects is not a common occurrence, and that the maternal mole cricket does do so is probably attributable to the fact that the male insect is known to feed upon them. Young mole crickets feed upon the many insect larvae and earthworms which exist in abundance in the soil, and may take as long as three years to come to maturity. Although generally regarded as carnivorous, there is ample evidence to show that these insects are just as partial to a vegetable diet, and one need have no compunction in compassing their destruction. Further, in view of the extended period of life allotted to them, as insects, it is seen that crops grown in lands haunted by them are likely to suffer continuously from their attack. Indeed, in Porto Rico the mole cricket is considered the most serious insect pest of that island, and is reported to levy an annual toll upon tobacco, sugar cane, and small crops, which is estimated at over £20,000.

However desirable the destruction of mole crickets may be it must be confessed that there are many difficulties in dealing with them in actual practice. We are told that if water is thrown upon the ground and boards placed over the moist patches, the crickets will congregate there and revel in the pleasant conditions so provided, and also that they are attracted to sweetened bran. It is therefore suggested that the infested lands should be treated once or twice a week with the poisoned bran mash given below; and, in order to make this more attractive, it is spread on moistened soil and covered with boards or sacking.

Poisoned Bran Mash.—Bran or mealie meal, 1 lb.; white arsenic or arsenite of soda, ½ lb.; molasses, 2 quarts. If white arsenic is used it should be thoroughly mixed with the dry bran or meal and a thickish mash made by adding molasses and a little water. The arsenite of soda should be dissolved in a small quantity of hot water added to the molasses and then mixed with the bran or meal.

Free Distribution of Cotton Seed.

Correspondence has been received by the Department of Agriculture, through His Excellency the Governor-General, from the Under-Secretary of State for the Colonies, in which attention is drawn to the practice of distributing cotton seed to farmers by German firms on condition that the produce is consigned to them. Whilst the practice has much to commend itself, in that it enables farmers who are contemplating making a start in cotton growing to obtain the seed they require with little difficulty and free of charge, at the same time it has the disadvantage of obliging the grower to sell the produce of his cotton fields in one prescribed market without option. It should furthermore be realized—and it is probable that not many farmers in this country are aware of the fact—that the British Cotton Growing Association is offering just as great facilities to prospective cotton growers in the matter of obtaining seed free, and there is furthermore no undertaking required on the part of the farmer to sell his produce to the Association. In connection with this matter it may be of interest to quote from a letter addressed to Messrs. Mitchell, Cotts & Co., by the Association: "It will interest you to know", it is stated, "that we have already sent out a very considerable quantity of seed to South Africa without making any charge for the same or any stipulation as to where the cotton should be shipped, as we have always preferred to leave it free to the planter to send his cotton to whichever was the best market. As a matter of fact, we lose nothing by this, for in ninety-nine cases out of one hundred, the planter can obtain a higher price in Liverpool for his cotton than in any other market in the world; this is especially the case in good qualities of cotton, for the higher grades of cotton are principally used in this country." For the benefit of those interested, it may be stated that the address of the Secretary of the British Cotton Growing Association is 4, London Wall Buildings, London, E.C.

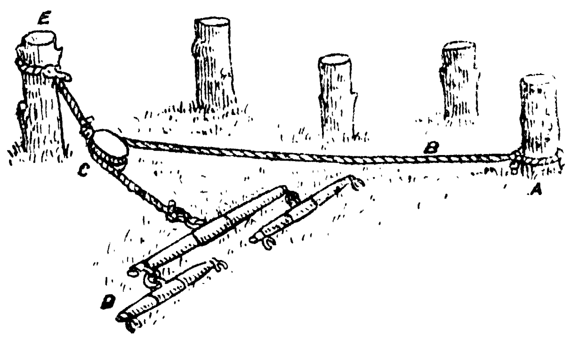
Natal Orange Export, 1910.

In the present issue will be found some extracts from a report on the results of the experimental export of oranges from Natal during the 1910 season. The idea of exporting oranges from Natal oversea is, of course, nothing new, similar experiments having been made in previous years, and in connection with the report now published, it may be of interest to learn the circumstances under which last year's experiment was undertaken. Owing to the success which attended the shipment of oranges from the Greytown, Pietermaritzburg, and Richmond belt during the seasons when the export of citrus fruits upon an experimental basis was under the direction of Mr. Claude Fuller, the Chief of the Division of Entomology and Horticulture in Natal, a small union of growers was formed to continue the export of oranges from this section of the Province in conjunction with the Division of Entomology and Horticulture. The members of the Union agreed to adopt as closely as possible all advice relating to picking, curing, and packing which Mr. Fuller thought, from the experience of previous experiments, it would be well for them to follow. By the courtesy of the then Minister of Agriculture, the Hon. W. A. Deane, Mr. Fuller's Assistant (Mr. Albert Kelly)

was allowed to act as honorary secretary of the Union, with a view to assisting members in matters relating to shipments, allocation of charges, etc., and in order to prepare an analysis of the results. Further arrangements were made whereby either Mr. Kelly or Mr. Fuller should be present to give practical advice and help in the packing and forwarding of the initial shipments. By this arrangement, and because of certain facilities given to the Union in the shape of box-wood, wrappers, and the loan of machine graders, the 1910 export was quite as much under the auspices of the Department of Agriculture as those of the two former years. The results, therefore, as published elsewhere in the present issue, are of both departmental and public interest, and the report will well repay perusal on the part of those in any way interested in the subject of the export of citrus fruits from South Africa.

A Method of Pulling Stumps.

A farmer in Connecticut, U.S.A., has hit upon a very handy device for pulling the stumps of peach trees from old orchards, and can, it is said, pull 200 or more a day by this means. The limbs are cut off and the stumps E (see sketch), left as long as possible. A



short rope or chain with a single pulley is attached to the top of the stump. The anchor rope, B, which runs through the pulley, is fastened to the bottom of a stout stump, A. A pair of steady horses is attached to the rope, and the pull is always directed toward the anchor stump. With a steady pull there is no jumping or jerking, and the horses will walk right off as if pulling a loaded cart. It is recommended that about sixty feet of one-inch rope be used for the purpose.

South African Wool in America.

An interesting communication has been received, through the Under-Secretary of State for the Colonies, from the British Consul-General in New York in response to a request for information as to why South African wool is not imported into the United States of America, where it is thought a profitable market might exist for South African products. In the course of his letter the Consul-General says: "I learn on inquiry that the main reason is that the

strain of sheep in South Africa is inferior, from a wool-producing point of view, to the strain in Australia. The consequence is that Australian wool and South African wool would pay exactly the same duties, but that the Australian wool being better in quality and cleaner is more acceptable for the American market, whilst on the other hand the South African wool arrives in a dirty condition, and duty has to be paid on the dirt." A firm to whom the Consul-General wrote upon this subject state that very little South African wool is imported at the present moment "on account of there being so much soil put in the wool. When the wools are properly put up in a marketable condition they can be imported into the United States to good advantage, but so long as farmers continue to put so much soil to add to the weight of the wool, the chances of importation are against them. The wool itself can be used by American manufacturers to good advantage when put in a marketable condition".

The Consul-General proceeds to quote from a letter received from the Agent in New York of one of the South African Banks. "The reason", it is stated, "why South African wools are not now imported into the United States is the following:—The sheep in South Africa are of Merino stock and their wool consequently comes under Class 1 of the existing Tariff, which does not permit of the wools being washed before shipment under penalty of 'double duty' being paid. Owing to local conditions or causes, the South African wools contain a heavy percentage of foreign matter, such as dirt, grease, or other substances, and the shrinking in the process of scouring is correspondingly heavy—say, running from 55 to 70 per cent.—and when this shrinkage is applied to the price (after adding the duty, which is 11 cents per pound), it brings the cost of the scoured wool very high. Australian wools of Class 1 are naturally much cleaner in character and in consequence lose in scouring a much lower percentage, and as they are assessed at the same rate of duty (11 cents per pound) the scoured product is much cheaper relatively than in the case of South African wool. I should think that if proper care were taken by the farmers in South Africa, they should be able to produce, without using artificial methods that would conflict with the Tariff requirements, a sufficiently clean character of wool that would compete successfully with the wool from Australia in this market, as the defects above specified are, I think, the only obstacle to their doing so at the present time. Should the scale of duty be lowered or abolished altogether, then South African wools could again be imported freely to this market as they were in former years of 'free wools', but while the present high tariff holds, a radical improvement is necessary if the farmers wish the benefits of this market."

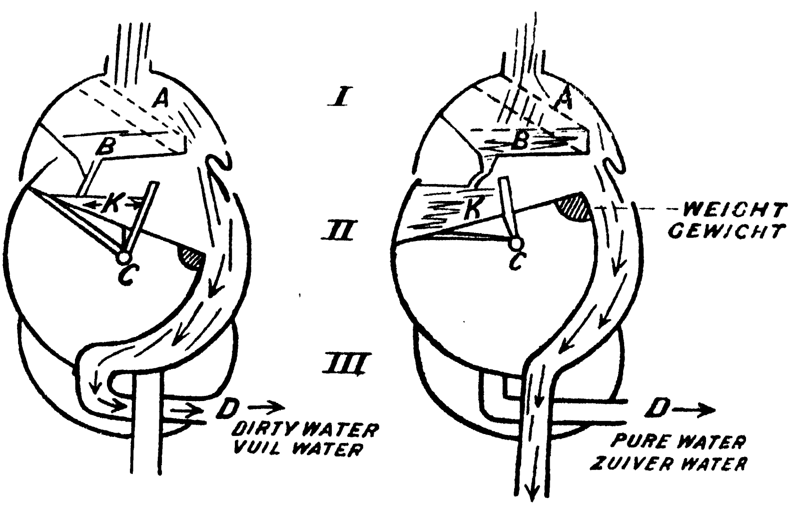
In concluding, the Consul-General says: "Were there direct communication between South Africa and New York it would probably lead to an increase of shipments from South Africa, but I do not think that the want of direct communication can, in view of the facts stated above, be in any sense the real cause of South African wool not coming to this market."

The Gamka Floods.

The following interesting letter has been received by the Department from Mr. W. M. Cameron, Klein Kruitfontein, P.O. Fraserburg Road, Cape Province:—It may interest you to know that, prior to the recent Gamka floods, I took a careful cross-section of this river, where it passes Mr. Dicey's farm, Klein Kruitfontein, Kruitfontein Siding, and during the days the river was in flood the depth of water was carefully registered and the speed measured. From these data, which I have every reason to believe correct, I calculated that, approximately, the enormous quantity of 864 millions of cubic feet of water, holding 3 per cent. of silt in suspension, passed during the four days the river was in spate: sufficient to cover 86,400 morgen of land 1 ft. deep in water and deposit a layer of fertile silt a quarter of an inch thick. This in a part of the country where the soil is probably of the richest in the world and only requires water to grow anything to perfection.

A Rain-water Separator.

In view of the dependence of farmers in most parts of the country upon the rainfall for their water supply, some particulars of a useful separator for removing, when a heavy shower comes, the first filthy water which contains impurities from the air, and which has washed off the roof of the house, and running it off into the drains so that it may not pollute the household water supply, will probably be of



interest to many. This separator is described in a Canadian contemporary, and the sketches reproduced herewith will facilitate a ready understanding of the idea. The contrivance consists of three pieces, I, II, III (see sketch), of which parts I and III are stationary, but part II can revolve around its centre, C. The right half of this revolving part is heavier than the left half, through the addition of an iron weight, so that, ordinarily, the right half is in its lowest position as represented in the first sketch. In this position the stack

pipe coming from the roof is directly connected with the drainage pipe, D, at the bottom; consequently, the first impure rain that falls in a heavy shower immediately runs into the drains and not into the storage tanks.

When entering the apparatus, the water runs over the perforated surface, A, and drop by drop trickles in the small reservoir, B. This reservoir is connected by a syphon with reservoir K in the left half of the movable part II. At the moment B is full of water, the syphon empties suddenly all this water into reservoir K, and soon the left portion to which all this water weight is added becomes the heavier of the two, and the apparatus revolves to the left, thus assuming the position shown in the second sketch. Now the stack pipe from the roof is connected with the pure water pipe going into the tank, and for the rest of the shower pure rain water is collected in the supply tanks. When the shower is over the reservoir K gradually empties itself, the right half becomes heavier than the left half, and the apparatus revolves back to its former position, and everything is ready for a new shower.

South African Fruit Paste.

In the February issue of the *Journal* appeared a note relative to the fruit paste which has been brought to the fore by Mrs. Van den Bosch, of Harrismith, and the South African National Union. The following letter and further notes on the subject have since been received and are published at the request of the Secretary for Agriculture. The letter is from Miss A. S. Cruikshank, Holmesdale, Redlands Road, Reading, England, and reads as follows:—" I would like to draw your attention to the notice the Trades Commissioner for South Africa has sent to your Department *re* fruit paste. I, Miss Cruikshank, brought back with me from Harrismith a very beautiful collection of dried fruits made by Mrs. T. van den Bosch, Riverside, near Harrismith. The fruit paste was the chief exhibit. It occurred to me that this might be turned to good account, so I got some professinal cooks to experiment with it. The result was quite satisfactory. By soaking in warm water, ¼ lb. to ½-pint water, it was reduced to pulp and ready for any use in cooking. My first idea was to protect the invention, which I have done by taking out a patent in my own name. Since then I have exhibited and proved that there will be a good market for it, principally for travellers, army, navy and merchant service, on account of its portable shipping qualities. The weak point is the supply, but surely with all the fruit in South Africa some one could start making it. Mrs. T. van den Bosch makes it to perfection, and any one starting ought to work with her. Indeed, I should refuse to work with any one who did not bring her trade mark or go shares with her.

" Mrs. T. van den Bosch asked me to take her collection home so as to show English people what Hollanders could do. She little knew the use it could be put to, and which I never thought of until my arrival in England. Mrs. Van den Bosch told me her secret of how the fruit paste was made, and so I was able to take out a patent

as the importer. I am very keen about South Africa turning this invention to account, as I feel confident of its success. There is a demand for the fruit paste for cooking purposes, and no doubt in its original form also. I am told that we shall have to push the thing, otherwise other countries will take up the idea. I am quite prepared to go on working it up if I can get a regular supply, but it must be on a business footing. I shall get a good man as partner. I have just had the exhibit in the big cookery exhibition at Westminster, and while there experiments were made by the Nautical and Vegetarian Chefs with the same satisfactory results. The Agent, South African National Union, Bam's Buildings, Capetown, will give you further particulars."

From the above it would appear that some opportunity offers for the sale of fruit paste oversea, and any who can produce the article in question (and their name is legion) are invited to approach either the Agent, S.A. National Union, Bam's Buildings, Capetown, or Miss Cruikshank, whose address is given above. It would appear that Miss Cruikshank was under the impression that Mrs. Van den Bosch held a monopoly in this particular product, whereas the facts of the case are that it is made by hundreds of housewives over the length and breadth of South Africa. Should any considerable demand be forthcoming, it would be highly desirable that some arrangement be arrived at whereby an article as nearly uniform as possible should be produced for export. For instance, the paste should be available in slabs of certain sizes and numbers to the lb. package or whatever other weight might commend itself most to the market. The old custom of rolling would have to be abandoned on account of the larger bulk and consequent greater space required. The packages containing the paste should be neatly and attractively put up and labelled, giving particulars on the outside as to the contents, etc. These latter details might best receive attention from Miss Cruikshank, should the venture prove a commercial success.

Bee-keepers' Examination.

The first examination ever held outside the British Isles for the British Bee-keepers' Association's Expert Certificates was held in Pretoria, on Saturday, the 28th January, 1911. The examiner, a member of the Pretoria District Bee-keepers' Association (Mrs. Stewart Russell), is the first lady of South African birth to hold third and second class certificates. The oral examination was conducted at the house of Mr. Stewart Russell, and the practical at Mr. Webb's Apiary, both at Silverton, near Pretoria. The candidates were Mr. D. Cairncross and Mr. Taylor. All the persons mentioned are members of the Pretoria District Association. This association is now affiliated with the parent body in London, and is making arrangements for further examinations. The secretary (Mr. Robert Sharp, The Vinery, Wonderboom) will be glad to furnish further information.

The Anti-Malarial Campaign.

The South African Anti-malarial Associations, which have been formed with a view to educating public opinion in regard to the necessity for combination in the destruction of malaria-bearing

mosquitoes, have lately issued several pamphlets and leaflets in pursuance of their propaganda. One of these publications takes the form of a wall-card, setting forth the habits of mosquitoes and describing how the pest may be got rid of. Two pamphlets have also been received by the Department, one by Dr. Henry L. Gordon, of Messina, Northern Transvaal, on "The Prevention of Malaria in the Northern Transvaal", and the other by Major Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., C.B., etc., on "Malarial Fever: How it is caused and how it may be prevented". The pamphlets are published by the Argus Printing and Publishing Company, Ltd., of Johannesburg.

"Studies in Agriculture."

Mr. E. R. Sawer, the Director of the Division of Agriculture in Natal, has issued the first three series of his "Studies in Agriculture". The first consists of a general review of agricultural conditions throughout the world, comprising, among others, essays on "The Empire and Agriculture", "The Single Crop Abuse", "The Place of Live Stock", "The Importance of Leguminous Crops", and "The Status of Oil Crops". The other two deal respectively with "The Soya Bean" and "Cotton in Natal", which should prove valuable to farmers in that Province and elsewhere who are devoting attention to the cultivation of these crops.

Book-keeping for Farmers.

Farmers who are desirous of keeping an accurate record of their farming operations will doubtless be interested to learn that the African Book Company, Limited, of Grahamstown, have brought out a second edition of their useful *South African Farmers' Book-keeping*. Beyond furnishing a model account for guidance, this book is not, as its title might lead one to expect, a treatise on book-keeping, but is ruled and headed for actual book-keeping. The accounts which it includes cover a comprehensive field and should prove useful to those who wish to do more than keep merely a rough account of their operations. The publishers have also issued an *African Farmers' Stock Register* in a handy pocket edition for use in the field; a desk edition is also obtainable with larger spaces for particulars and also columns for prices given and obtained.

Pinus Insignis in South Australia.

ITS INTRODUCTION AND SUCCESSFUL UTILIZATION.

By WALTER GILL, F.L.S., F.R.H.S., Conservator of Forests, Adelaide, South Australia.

[NOTE.—The following paper was read by Mr. Gill at the Industrial Exhibition in Brussels on the 20th May, 1910, and should, in view of the suitability of *Pinus insignis* to many parts of South Africa, be of interest to readers in this country. A copy of the paper was furnished to the Union Forestry Department by Mr. Gill at the suggestion of the Conservator of Forests for the Transvaal.]

BOTANICAL DESCRIPTION.—The "Remarkable Pine" was introduced into Australia by the late celebrated botanist, Baron Sir F. Von Mueller, K.C.M.G., M. & Ph.D., F.L.S., F.R.H S., etc., who adopted the name *Pinus insignis* as its scientific designation. This name was given it in 1844 by Loudon, though Don had already found and named it *Pinus radiata* seven years earlier in 1837. J. G. Lemmon, late botanist to the Californian Board of Forestry, in his "Handbook of West American Cone Bearers", referring to this tree under the name "Monterey Pine", states that it occurs from Pescadero, near San Francisco, southward to Monterey and San Simeon Bays, particularly abundant on Point Pinos, on which the city of Pacific Grove has arisen. He describes the tree as follows:—"Largest trees 80 to 100 feet high, with black bark, very hard, and 2 to 3 inches thick. Foliage, bright green leaves in threes, 4 to 6 inches long; cones, chestnut brown, widely variable, obliquely oval or longer, 3 to 7 inches long, 2 to 4 inches thick at the base; scales on the outer side, especially at the base in the larger form, swelled out into nearly hemispherical tubercles or knobs ¼ inch to ½ inch high, and twice as broad, becoming devoid of prickles." Though, strictly speaking, *Pinus radiata* must claim priority of place, yet the name of *Pinus insignis* has become so widely known that it will be invariably used to indicate the tree in question, that being the one continuously employed when discussions as to its merits and demerits have taken place.

ARTIFICIAL CULTURE.—The aim of the culture of this tree in its native country has been apparently limited to growing it for ornamental purposes. The able botanist J. G. Lemmon states that it has been "largely cultivated for its abundant foliage and its rapid growing character, but it has been left to South Australia to discover and develop its economic importance".

Owing to the existence of so many valuable lumber pines over such wide areas in grand forests of the United States from which supplies of lumber could so readily be drawn, it was not necessary to hunt for trees suitable for producing good timber, still less to take any trouble to grow them. This, doubtless, has been the reason why a pine occurring over such a limited space should remain unknown to timber getters.

In South Australia this tree has been extensively planted for ornamental purposes, and large numbers of very handsome trees are to be found on various estates in different parts of the country.

In districts possessing a good elevation sufficient to moderate the trying effects of our dry heat, these trees have stood even the worst years of drought, but on the hot plains only a little above sea-level they have been unable to endure the heat, and have died where the Aleppo Pine (*Pinus halepensis*) and Stone Pine (*Pinus pinea*) have stood unaffected. Whilst it is of interest to note its value as a great addition to our ornamental trees, the economic aspect of the cultivation of this tree is the one, however, which especially claims attention in the present instance.

The trees have usually been reared in open beds from the seed, and in most cases are large enough after one year's growth to plant out. When, however, the ground to be operated on after being cleared of useless forest growth is liable to be overgrown with the common bracken fern (*Pteris australis*) or various species of *Hibbertia*, *Styphelia*, *Leptospermum*, *Acacia*, and other dwarf heath-like shrubby vegetation, plants two years old are used. Set out at 8 feet by 8 feet apart, they produce well-grown stems in 20 to 25 years' time with knots seldom greater than from ¼ inch to ¾ inch diameter. Test plantings have shown that spacing the trees 12 feet by 12 feet produces a timber too coarse for many purposes, that 10 by 10 is better, but 9 by 9 appears to be, all things considered, a more desirable distance than 8 by 8, unless a good demand can be anticipated for thinnings.

The smaller cone variety of this pine usually develops a much better balanced type of tree than the one bearing the larger cones; and some remarkably handsome specimens with ideal habits have frequently been developed when planted at wide distances apart, the side limbs being small, and the taper of the tree very gradual, giving a model trunk for milling purposes. On either a sandy or loamy soil overlying a good clay subsoil, with a rainfall varying from 20 to 30 inches according to locality, the losses on planting have seldom exceeded 5 to 10 per cent.

The method of planting adopted has always been "pitting" after the land has been roughly ploughed to a depth of 6 inches.

The trees have usually been pruned to a height of 8 to 20 feet after the canopy has closed sufficiently to cause the side limbs to die off, the time for which generally occurs at 8 to 10 years' growth when planted 8 by 8, but at a later age when spaced wider.

The circumstances under which the trees have been planted have varied widely. Sometimes land has been clear of all vegetation and the district free from all vermin. Then only good sheep and cattle proof fencing has been needed for protection, and the land had simply to be ploughed and was ready for planting. In other cases, when old useless forest timber had to be felled, carted, stacked, and burnt, and the stumps left in the ground (owing to the cost of grubbing them being prohibitory), the necessity arose for using the well-known stump-jump plough invented by a South Australian machinist.

These operations considerably increase the cost as compared with those of working cleared land, and still further outlay is essential where the introduced vermin such as rabbits and hares exist, or where the indigenous fauna, such as wallabies and small kangaroos, are found. Plantations are usually laid out in squares of ten acres, with

a half-chain break, or fire-guard, around each square, and the breaks are ploughed yearly as a protection against fire.

The cost of planting, including rearing the needed supply of trees, must, therefore, be calculated at from £5 to £10 per acre up to the final time of utilization.

SUCCESSFUL UTILIZATION.—In April, 1891, having occasion to remove a tree of only 10 years' growth to allow of the better development of others in the Wirrabara Forest, I had it cut up and utilized in several ways to test its value, though not expecting results of much importance at such an early age. It was grown on sandy and comparatively poor soil resting on gravel over clay subsoil. An ordinary kitchen table, 3 ft. 10 inches by 2 feet, was one of the articles made from the timber, and it is in good order to this day, having been made up 19 years. Some of it was also used for making a neat picket fence. A small-size chest of drawers was also made from the timber of another tree from the Bundaleer Forest 14 years old, and up to the present time it is in excellent order, though it is 15 years since it was made. All these articles were shown at several industrial exhibitions in Adelaide, and aroused considerable interest.

Trees of suitable size, when cut in half, make good ladders, which have lasted many years. Made into wheelbarrows, the wood proves very serviceable. It also serves well for the sides and bottoms of drays and wagons, and, owing to its secreting very little resin, it makes superior butter boxes. It has proved very satisfactory both in constructing the framework of houses, stables, and sheds, and also as weather-boarding for floors or ceilings, and when varnished has a most effective appearance. But whilst being suitable for all these purposes it is especially adapted for case-making owing to the fact that it will not split. This allows of its being nailed and renailed after opening without the incessant splitting which so often breaks up cases of other pine timber. The frequent danger of splitting while handling for stowing on shipboard or during the various stages of transit, thereby losing much of the contents of the cases, is also avoided by the resistance which the tough and tenacious nature of the timber gives to the jarring inseparable from the careless dumping of the cases on wharves and jetties so constantly experienced.

Calculations based on measurements taken in 1906 through a plantation 24 years old in the Wirrabara Forest show that the average annual increment was 160 cubic feet per acre per annum, but it is not so good where less favourable conditions exist. The soil in this plantation was a good red loam overlying a nice clay, and the elevation was 1500 feet above sea-level and 12 miles east of the shore of Spencer's Gulf. Other measurements were taken in previous years of 3736 trees of different ages standing on areas of varying size in different parts of the State, amounting in all to 11 acres. When these measurements are taken in conjunction with those first indicated it is shown that an average annual increment of 120 cubic feet per acre per annum may be expected.

The case known as the "Peacock" apple export case, which holds about one bushel of apples, contains six super feet of timber, and, using this as an illustration, it may be stated that measurements already referred to showed that at a moderate estimate this pine will yield 4000 such cases per acre in from 20 to 25 years' growth, according to soil and climate. As a matter of fact, more than that number

per acre have actually been cut from sample areas, and several individual trees have yielded as many as 60 cases each. These figures make all needed allowance for waste in conversion of the timber, and taking them as a basis we find that the value per acre will be at least £200 gross return, while the net return will vary from £80 to £100 per acre in from 20 to 25 years.

As a result of the success of the various tests the writer started a sawmill about seven years ago at the Wirrabara Forest, which is situated 120 miles as the bird flies from Adelaide, though much more by rail, for the purpose of making this timber into fruit cases to supply the requirements of the local fruit-growers. It is worked only during the busy part of the year when cases are required for fruit. Nothing is felled under 11 inches breast high, and as much as possible is hauled to the mill before the autumnal rains cause the trees to start fresh growth.

During the time this mill has been working 88,867 cases have been sold. They consisted mainly of export apple cases and raisin cases, though there were some butter boxes also.

The amount paid into the Treasury for these cases was £2656. At first the actual net profit was 50 per cent. of the gross receipts, but cost of production has somewhat increased, and a slight reduction in price has been realized. Notwithstanding this, the net return now is not less than 45 per cent. of the total receipts. The timber is much appreciated and gives every satisfaction; those using it being anxious to secure what they can annually ere ordering elsewhere.

While South Australia has taken the lead in the production of this timber it has also been grown on vacant areas on the water reserves to a limited extent by the Water Trust which supplies the beautiful city of Ballarat in Victoria with water. It was at one time considered there to be merely valuable for ornamental purposes, but ultimately the success attained in its utilization by the Forest Department in South Australia led the Water Trust to take steps to dispose of some of it, which they succeeded in doing satisfactorily, as they received a royalty of as much as £80 per acre for a considerable quantity 35 years old, the purchaser finding all the labour for felling and removing it.

They also proved its value in other ways by erecting a fine lot of pleasure houses and dining-rooms at some of the plantations near Ballarat much frequented as holiday resorts for picnic parties.

Although under-valued by many at first through ignorance of its qualities, it is now justly held in high esteem as a very useful timber.

DESCRIPTION OF ILLUSTRATIONS.—The photographs reproduced show the Remarkable Pine in various stages of growth, and descriptions are now given in numerical order of each photo with a view to conveying all possible information on the subject under review.

(1) The first view shows Remarkable Pines 22 years old in Wirrabara Forest. The fire-guard which appears in one corner has been ploughed in the usual way to keep it clear of grass and other vegetation, and thus makes it a sufficient protection against fire.

(2) The second view illustrates a severance cutting in another plantation of Remarkable Pines 24 years old, where the data were obtained which indicated the average annual increment of this pine to be 160 cubic feet. The soil of these two plantations is a good red loam over clay.

(3) The third photo gives a view of another plantation of Remarkable Pines in Wirrabara Forest, where the trees are 25 years old. The soil is a poor sand over gravel, with clay below. The indigenous timber in the front of the plantation is Box Gum (*Eucalyptus hemiphloia*, variety *albens*, F. Muell.) with one Sugar Gum (*Eucalyptus corynocalyx*, F. Muell.) in the near foreground.

(4) A severance cutting in the same plantation made when pines were 21 years old is shown in the fourth view.

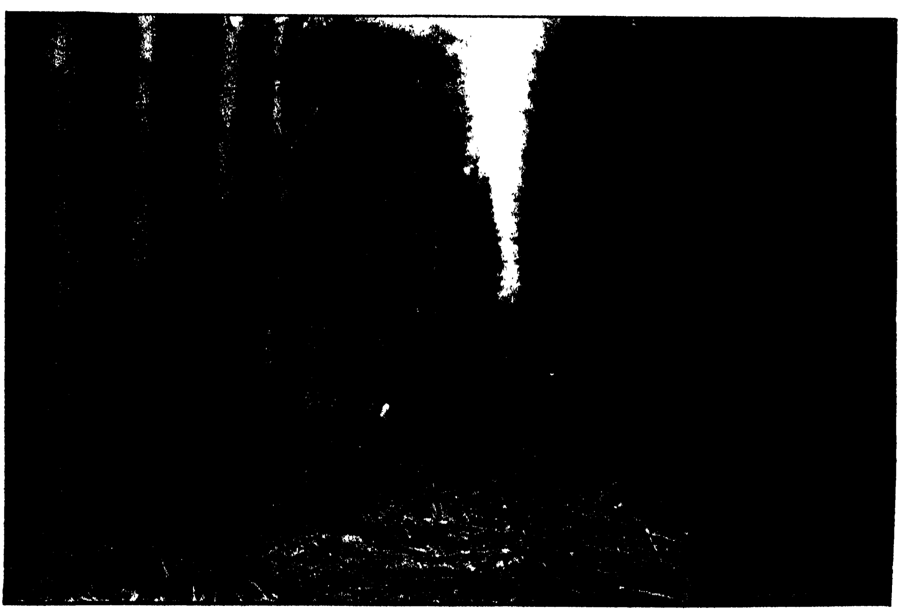
(5) The Remarkable Pines in the fifth view are 22 years old, and are growing near the residence of the forester in charge of Wirrabara Forest.

(6) The last photo gives an illustration of Remarkable Pines 25 years old felled ready for milling. They were afterwards converted into apple export cases, some of which were exported to Berlin containing apples which gained great credit for their superior quality.

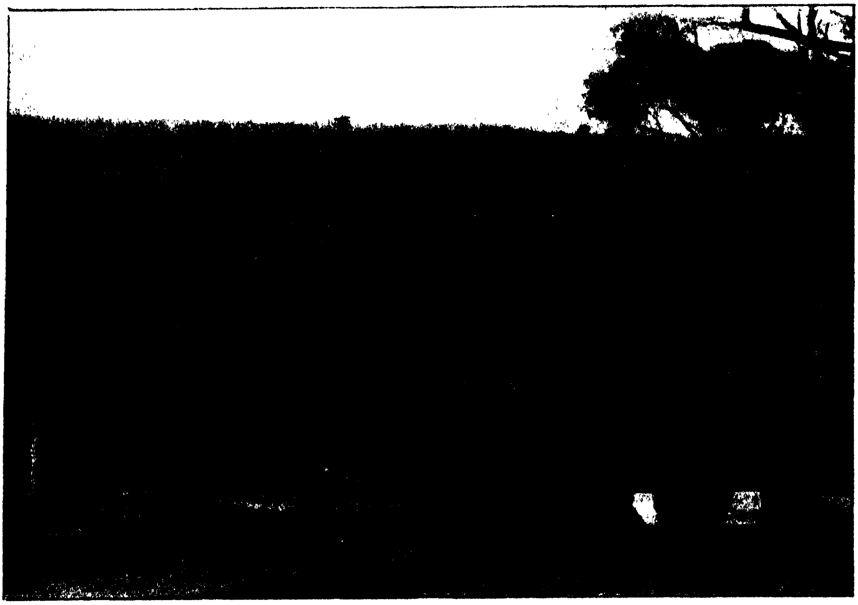
Having taken all these photographs myself, and obtained all particulars as to ages, etc., from the department's official records, I am able to vouch for the accuracy of all the details submitted in connection with this subject.

Pinus Insignis in South Australia.

Remarkable Pines, 22 years old, in Wirrabara Forest.



A Severance Cutting in a Plantation of Remarkable Pines, 24 years old, where the data obtained indicated the average annual increment of this Pine to be 160 cubic feet.

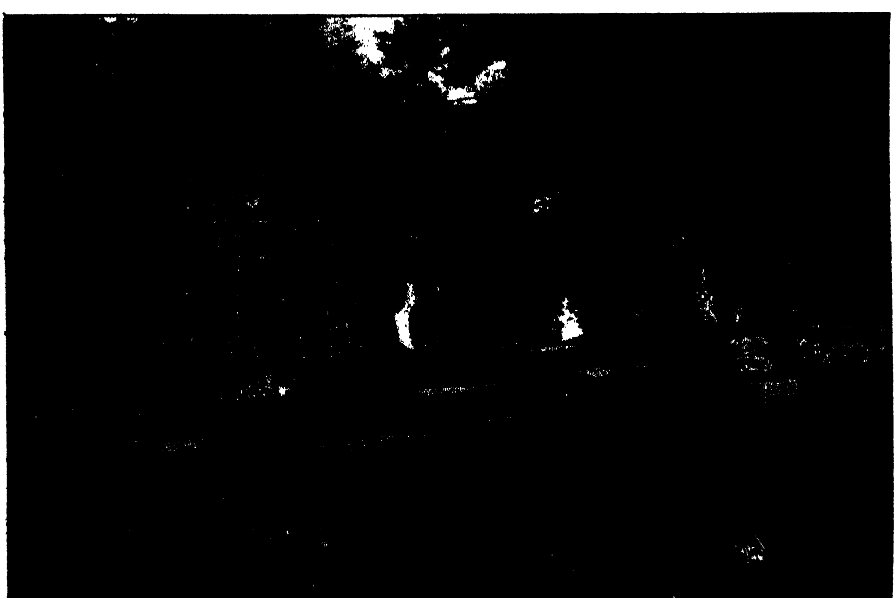


Another Plantation of Remarkable Pines in Wirrabara Forest. The trees here are 25 years old. The trees in the foreground are Box Gum (*E. hemiphloia*), with one Sugar Gum (*E. corynocalyx*) in the near foreground.

A Severance Cutting, in the same Plantation as the above, made when the Pines were 21 years old.

Pinus Insignis in South Australia.

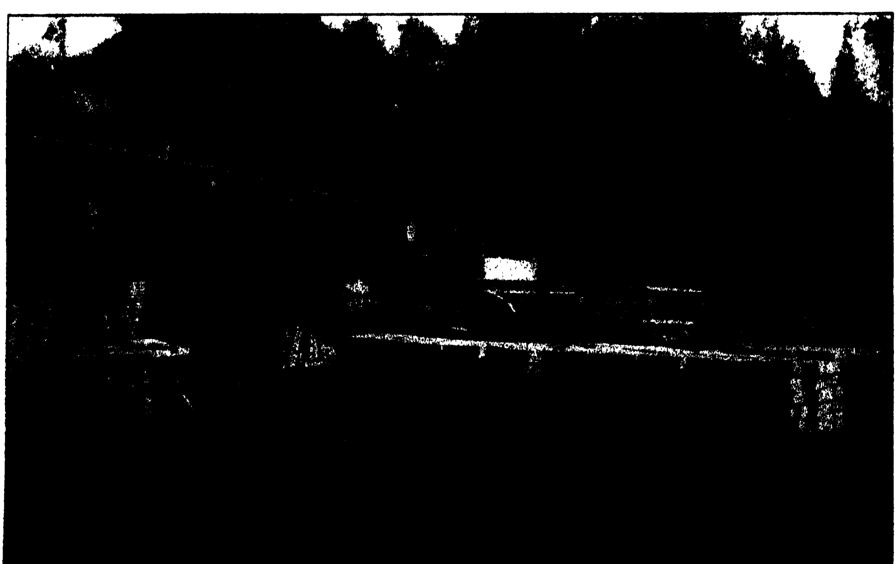
These Pines are 22 years old, and are growing near the residence of the Forester in charge of Wirrabara Forest.



Remarkable Pines, 25 years old, felled ready for milling.

Pinus Insignis in South Australia.

Avenue of *P. insignis* in the Mount Burr Forest Reserve in the south-east of South Australia. The trees here shown are 23 years old.



Raisin Cases being loaded at Wirrabara Forest Sawmill.

Farm Forestry in the Orange Free State.

By C. C. ROBERTSON, Assistant Conservator of Forests, Orange Free State Conservancy.

(Paper read as a lecture in Vacation Course for School Teachers, Bloemfontein, 5th January, 1911.)

A FOREST is any land covered with a continuous growth of trees. The trees may be of any size or species, but it is necessary that they should stand close enough to influence each other's growth. Forestry may be defined as being everything that has to do with the proper management of forests for the attainment of the objects of the owner. This " everything " includes all the various branches of Forestry, e.g. :—

Sylviculture which deals with the formation and treatment of forests and the principles underlying the growth and reproduction of trees, etc.;

Forest Botany;

Forest Mensuration, or the measuring of the size and volume and growth of trees and whole forests;

Forest protection, or the protection of forests from fire, insects, fungi, etc.;

Forest Finance, or business side of forestry;

Forest Utilization, or the felling, sawing, manufacturing, and marketing of timber, and the numerous other forest products;

Forest Surveys;

Forest Management, which provides for the proper and methodical working of forests; and finally

Forest Policy, which refers to the policy of the State with regard to the Conservation and extension of Crown Forests for the supply of timber or for the various indirect benefits of forests, and to the encouragement of private forestry and so on.

It will be seen that the science and business of Forestry is a very large subject which, like other professions, requires special knowledge and experience.

Farm forestry forms a very small part of the subject, but a farmer who sets about tree planting in an intelligent, methodical, and economical manner, may rightly be said to be practising forestry.

In the first place the farmer should have a clear idea of the objects for which he wishes to plant trees, because the selection of species, the distance from each other at which the trees are planted, and so on, depends on the object of planting them. Now the objects for which it is desirable to plant trees on most farms in this Province are as follows :—

1. ORNAMENT SHADE AND SHELTER near the homestead and generally the increase of the comfort and beauty of the home.

2. SHELTER FOR THE FARM.

(a) *Shelter for stock against hot and cold winds and shade from the sun and protection against hail.* It is well known that stock do much better and require less winter feed on farms which are naturally sheltered by kopjes, and equally good shelter can be provided, even on the most exposed farm, by planting belts and clumps of trees. The death of winter lambs and other stock, caused by the cold storms of winter and destruction of stock by hail, could be prevented if shelter were provided.

(b) *Shelter for agricultural crops and conservation of moisture in the soil by breaking the force of the wind.* Evaporation of moisture varies in proportion with the velocity of the wind, and so the more the force of the wind is broken by belts of trees, the more moisture will be kept in the soil to be available for the growth of crops.

The evaporation of water when a hot dry west wind is blowing is enormous, and shelter belts should form an important part of the system of dry-land farming.

(c) *Shelter for orchards* against the cold winds in spring which destroy the blossoms, and the strong westerly winds which dry out the soil and may cause windfalls of fruit and break off branches. Except in specially sheltered situations, the first thing to do in laying out an orchard should always be to allow for ample room for good windbreaks on the sides from which the worst winds blow and to get the trees established at once so that they will begin to shelter the fruit trees from the start.

3. PREVENTING AND ARRESTING THE EROSION OF THE SOIL, and particularly preventing the formation of dongas, keeping them from getting larger, and gradually filling them up.

4. THE PRODUCTION OF WOOD FOR VARIOUS USES PRINCIPALLY AS FOLLOWS:—

(a) *Fuel.*—The comfort and cheapness of having a plentiful supply of wood fuel grown on the farm can hardly be imagined by the large proportion of farmers in this Province who have never used it. Every farm here should produce its own fuel of wood, especially as this would allow of the material usually used as fuel at present, being used instead for its proper purpose of preserving the fertility of the soil.

(b) *Fence posts and droppers.*—In all countries in which wood is plentiful, wooden fence posts are used and not stone ones or iron standards. Durable fence posts can easily be produced in this Province from fast-growing trees, and apart from the convenience of having them on the farm, they should prove cheaper than the other materials.

(c) *Poles* of various sizes for the many uses on the farm for which they are required, e.g. erecting sheds for animals and implements, gates, etc.

In many cases, two or more of these objects can be combined. For instance, shelter belts for stock would also produce good fuel or fence posts if kinds of trees are selected which are good for both purposes.

SELECTION OF SITUATION AND SPECIES.

After the farmer has thought out the object or objects with which he wishes to plant trees, the next thing is to settle on what kinds he will plant in certain places or what places he should choose for planting the kinds which are the best for the given objects.

The position of shelter belts will usually depend on other circumstances, but often the farmer could use foresight in the location of his camp fences, etc., so as to allow of the shelter belts along them being planted in suitable soil. In the case of plantations for wood, the farmer could and should select the most suitable soil he has for the growth of the most suitable kinds. In moist countries the poorest most shallow ground can be used for tree planting, and even in this country certain kinds of trees can be planted on such soils, but the result will be slow and growth may be crooked. The value of the plantation to the farm is so great that the farmer could well spare some of his deep arable soil, though not necessarily his richest agricultural soil. Some people still seem to think that trees cannot be grown except on irrigated lands. The growth of trees will naturally be much more rapid if irrigated and if irrigation can always be kept up in dry seasons as well as wet ones, there is no objection to using it. If, however, it is not kept up in dry seasons, the trees are all the more likely to suffer from drought, owing to their being accustomed to irrigation. Usually irrigated lands are of much more value for agriculture than for tree planting.

THE LOCALITY.

Now the important points of any given locality with regard to the growth of trees are as follows:—

(1) *The general climate and especially rainfall.*—As regards this, the Orange Free State may perhaps be roughly divided into three parts, the better watered eastern and northern districts, the dry western and southern districts, and the intermediate districts in the middle of the Province. Generally speaking, some kinds of trees will grow best in one of the parts and other kinds in another part, but no definite rules can be laid down because of the great variation in local conditions. For instance, a kind which requires particularly deep moist soil in the dryer districts may do well in more shallow soil in the eastern districts.

(2) *The kind of situation* which largely determines the temperature and moisture of the locality. The situation may be an open one exposed to all winds, or it may be sheltered by kopjes from the dry westerly winds and exposed to the cold southerly storms or vice versa. It may be low lying, as along the banks of a river or spruit, and so may be subject to very severe frosts, or it may be high lying and warm. It may be on a northern or western side of a mountain or kopje and so get the full strength of the sun's rays, or may be on the cooler southern and eastern aspects.

(3) *The nature and depth of the soil, sub-soil, and rock.*—These must be found out by digging pits at least 3 or 4 feet deep, if they cannot be seen in the banks of dongas. As regards nature of the upper soil, this may be very sandy, or a sandy loam or a loam or clayey loam or pure clay or pot clay, or

turf which is soil mixed with a considerable amount of decayed vegetable matter, or it may be gravelly or have large rocks mixed in it. Sometimes the soil is uniform down to the rock, but usually there is sub-soil in between. The above descriptions apply also to the sub-soil, and the latter is usually more important than the surface soil, especially when the latter is shallow, because the roots of the trees should make their way into it and draw their moisture and other nourishment from it. The depth of the upper soil should be noted and also the depth of the sub-soil, i.e. the distance from the top of it down to where rock begins. If there is a " pan " or layer of especially hardened soil, as is sometimes found in vleis, it should be noted together with its distance from the surface, because it may prevent the roots from penetrating the sub-soil and make the surface soil subject to extremes of wetness and dryness. The nature of the soil and sub-soil are important, not only because different kinds of trees like soils of different consistency, but also because the nature, together with depth of the soil, determine its moistness to a large extent. Local experience as to the moistness of different soils is, however, very important. A clayey soil usually retains moisture better than a sandy one, but in a dry season a hard pot clay does not allow the little rain that falls to soak in as well as a sandy one does, and so it may become much drier than the latter after a long period without good rains. Sometimes as in the neighbourhood of rivers and dams, there is permanent water or a " water level " close enough to the surface to keep the sub-soil always moist, so that many kinds of trees could be grown which require continual moisture.

Stones or loose rocks mixed in a soil are often beneficial because they help to keep it open and allow the roots to penetrate it easily.

The mineral composition of the soil, though important, is usually not so important as its texture, and it would practically never be necessary for a farmer to get a soil analysed with a view to tree planting. It is, however, important to know if the soil is " brak ", and if it is very poor in lime or contains so much of it that some trees will not be able to grow in it.

Then as regards the rock, if this is at all near the surface it must be noted whether it is ironstone, sandstone, or shale, etc., for different species prefer the soils formed from different rocks. A rocky soil is often a very good soil for many kinds of trees, but it is necessary that the rock should be loose and crumbly or at least contain plenty of fissures so that the roots can penetrate it easily.

In parts of the country hard flat sandstone rock is found at only a few feet below the surface, and it is practically useless to try to plant trees under such conditions. Not only will there be insufficient soil space for the trees, but also what soil there is will dry out very rapidly, having no sub-soil below from which to draw up moisture.

SUITABILITY OF SPECIES FOR DIFFERENT PURPOSES AND LOCALITIES.

Now when the farmer has settled on the various objects for which he wishes to make plantations and has thoroughly examined the various situations, the next step is to select the best species, i.e. the species which in the first place are thoroughly suited to the situations and which also will fulfil his objects as well as possible and in as short a time as possible. This requires a good knowledge of the requirements and characteristics of different species, and often it will be advisable for the farmer to obtain special advice, unless tree planting which has been carried out on neighbouring farms affords object lessons. I cannot attempt here to go in detail into the characteristics of the numerous kinds of trees which may be grown in the Free State, but I will confine myself to consideration of a few of the most useful and suitable kinds.

These are of three main kinds, viz., (i) conifers, such as pines and cypresses ; (ii) gums or eucalypts; and (iii) deciduous trees which, unlike the others, lose their leaves in winter. One or two sorts, such as the wattles and peppers, do not come under any of these heads.

SPECIES SUITABLE FOR VARIOUS PURPOSES.

Deciduous trees are not to be recommended for shelter belts, because they have no leaves at the time of the year when the worst winds are experienced. Some kinds, however, such as willows and poplars, might well be planted singly or in groups in camps where they will give welcome shade to the animals in summer.

As regards wood production, Robinia is a deciduous kind which gives an excellent strong hard durable wood, suitable for fence posts and other purposes. Willows give a wood which comes in useful on a farm for the special purpose of brake-blocks for vehicles as well as being a fair fuel, and poplars yield light poles and sticks suitable for many purposes, such as hut building.

For planting in dongas, along their banks and around their heads, the poplars and especially the white poplar are most suitable wherever the soil is fairly moist. Elms and Robinia are also suitable, and the latter may be used in comparatively dry places. All these kinds have spreading roots which throw up suckers readily, especially when the soil is disturbed.

Conifers are the best trees for dense or low or medium sized wind-breaks owing to their dense foliage, and are much to be preferred to gums for wind-breaks round cultivated lands as their roots do not spread so far and use up less water.

Cypresses are on the whole better than pines for wind-breaks, because they are usually of more rapid growth at first; they retain their lower branches much longer and have denser foliage.

All the kinds of cypresses are suitable for wind-breaks. The fastest growing kinds such as *Cupressus macrocarpa* and *lusitanica* will naturally be preferred when the situation is moist enough for them. *Cupressus arizonica* combines great hardiness with fairly rapid growth, and so is an excellent wind-break tree for the drier districts. The same applies also in a large degree to *Cupressus sempervirens*.

Juniperus virginiana and *Thuya orientalis* are similar to cypresses as to foliage, but being slow growing and only reaching a small size, they are not good trees for wind-breaks except when a low wind-break is specially required.

Pines are good for fairly high and dense wind-breaks, and though not usually so fast as Cypresses at first, they are likely to reach a greater height in the end. *Pinus insignis* being of fast growth from the start and reaching a large size is specially suitable. *Pinus halepensis* usually has denser foliage and retains a bushy habit longer than other kinds of pines, and so is very good for dense lower wind-breaks.

As regards the production of wood, conifers produce the deals of commerce, of which large quantities are imported into South Africa, and are consequently planted very largely at the Government plantations, but farmers will not usually try to produce this class of timber. The woods of the common pines are not durable in contact with the ground and are not very strong. That of *Pinus canariensis* is superior to the others in these respects. Cypresses, Junipers, and Callitrises, however, yield what are known as Cedar woods, which are durable in the ground. They are thus to be preferred usually to pines as farm trees, because of their superiority as regards both shelter and wood. *Cupressus sempervirens* especially yields a most excellent strong durable wood, and it should be planted much more commonly than it is.

Gums.—Owing to their rapid growth and the strong durable timber and good firewood yielded by many kinds of gums, they are the trees best suited for the farmer's objects of providing quick shelter for stock and producing wood for farm use.

Many people still talk about blue-gum as if there was only one kind of gum, whereas there are about 150 different species, of which fifteen are, generally speaking, to be recommended for planting in the Free State. The true blue-gum, *Euc. globulus*, is not one of these.

The fastest growing kinds will naturally be preferred for wind-breaks if the quality of the wood is no object, but belts of gums may be very well grown for both purposes combined. The fastest kinds and those which reach the largest size are *Euc. viminalis*, *amygdalina*, *Gunnii*, and *Stuartiana*, but their timbers are light, weak, and not durable and inferior for fuel, especially in the case of the first two. They give, however, good straight long poles, suitable for many purposes, such as the roofs of cattle sheds.

Euc. rostrata and *tereticornis* are the next fastest and largest and yield excellent durable wood, and so they should often be preferred to the kinds above mentioned.

Euc. panciflora is about equally fast as *E. rostrata*, but the timber is only moderate.

Euc. sideroxylon is slower but fairly fast after the first few years and makes straight stems. Its wood is excellent, being extremely strong and durable. It is the best gum to plant for timber wherever the situation is suitable.

Euc. polyanthema, *melliodora*, and *hemiphloia* are of about the same rate of growth as the last and yield very hard tough heavy woods, durable in the ground and excellent for fuel. These kinds reach a comparatively small size and have fairly dense foliage, so are good for medium sized wind-breaks.

Euc. microtheca and *Euc. bicolor* are also of about the same rate of growth and have good timbers, especially the former.

Other evergreen trees.—The Pepper tree hardly deserves mention, except that it can be used for forming a very quick low shelter in situations warm enough for it.

The Wattles and especially the hardier Silver Wattle (*Acacia dealbata*) are worth growing for shelter in warm enough situations, and yield good fuel and useful poles. Growing Wattles for their bark cannot be recommended in this Province.

REQUIREMENTS OF DIFFERENT SPECIES.

I will now give briefly the main requirements of the various common species and the localities for which they are suitable. It is impossible to take into consideration all the various kinds of localities in the Free State, and so these statements should only be taken as somewhat rough guides.

It should also be remembered that though a species may be very hardy to drought in dry localities this does not mean that it will not grow better under moister conditions. It may be the best species to plant in both localities.

DECIDUOUS TREES.—All *willows* and *poplars* prefer to be near permanent water, but this is not necessary if the soil is deep and retains moisture well. In the drier districts, spruits, river banks, vleis, the neighbourhood of dams, etc., are the only suitable situations.

Robinia prefers moist but not wet situations, but is hardy even in rather dry soils. Does not object to lime.

Tamarix.—Very hardy to drought and does not mind lime.

All the deciduous trees are very hardy to frost, but may suffer from late frosts in very low situations, until well established.

CONIFERS—Pines.—Almost all pines prefer loose fairly deep sandy or loamy soil, and it is an advantage rather than otherwise if it contains loose rocks.

Pinus insignis and *pinaster* are not hardy to drought in the drier districts unless in exceptionally moist soils, but thrive in well drained soils in the wetter districts. Hardy to frost in the coldest situations.

Pinus halepensis is very hardy to drought, will grow on dry rocky soil or limestone, and does not seem particular as to whether soil is sandy or clayey. Quite hardy to frost.

Pinus canariensis.—Even hardier to drought than *Pinus halepensis* and can be planted on shallow rocky soil, but rather tender to frost and should not be planted in hollows.

CYPRESSES.—*Cupressus macrocarpa* and *lusitanica* require deep exceptionally moist soils in the drier districts and deep soils even in the moist ones. Hardy to frost but sometimes injured in the coldest situations.

Cupressus sempervirens.—Hardy to drought, though not on the driest soils in the dry districts, and does not mind lime. Well worth planting for timber in deep fairly moist soils. Hardy to frost except in coldest situations.

Cupressus arizonica.—The hardiest cypress against both frost and drought, and to be recommended for dry soils in the drier districts.

Cupressus torulosa.—Also very hardy to frost and drought and does not mind lime.

OTHER CONIFERS—*Juniperus virginiana.*—Very hardy to frost and drought and grows on lime.

Callitris robusta.—Very hardy to drought and fairly hardy to frost. Suitable for dry sandy or gravelly soils in the dry districts.

GUMS.—*Eucalyptus Gunnii, viminalis, amygdalina, pauciflora,* and *Stuartiana* all require a good deal of moisture and must have deep moist soil in the drier districts. Being very hardy to frost they are specially suitable for low-lying lands in the wetter districts.

Eucalyptus sideroxylon, rostrata and *tereticornis* suffer from frost in the coldest situations and should not be planted in low-lying ground in the wetter districts, but otherwise are hardy to frost and drought almost everywhere. *Euc. sideroxylon* and *rostrata* do well in sandy

soil in the western districts and do not mind lime while *Euc. rostrata* does not mind brak.

Euc. tereticornis seems to prefer more clayey soil. *Euc. sideroxylon* is the hardiest gum on dry rocky soils.

Euc. hemiphloia.—Rather tender to frost, but hardy to drought on shallow rocky soil or harsh pot clay.

Euc. microtheca and *bicolor.*—Fairly hardy to frost and very hardy to drought. Require plenty of heat, and most suitable for sandy soils in the drier hotter districts.

Euc. melliodora and *polyanthema.*—Very hardy to drought and frost almost everywhere, particularly the former.

OTHER EVERGREENS.—*Acacia dealbata* (Silver Wattle). The hardiest of the wattles in this Province, but should only be tried on warm sandy or loamy soils of fairly good depth in warmer situations. The same applies to the Black and Green Wattles.

PRACTICAL OPERATIONS OF FARM FORESTRY.

Having selected the right kinds of trees, the next thing is to plant and care for them properly.

Fencing.—It is quite useless to grow trees if they are going to be eaten off by goats or tramped or broken down by cattle and other stock, and the area to be planted must be fenced before a tree is planted. Fences enclosing shelter belts for stock may be removed after a time so as to allow the animals to get shade and shelter under the trees, but this should not be done until the trees are quite large and have lost naturally all their lower branches so that the animals only have the bare stems to rub against.

Preparation of the Ground.—Thorough preparation of the ground is essential. The whole area to be planted should be ploughed up and ploughing should be done as deeply as possible.

The ground should be ploughed once some time before planting and a second time shortly before planting, and harrowing should follow soon after ploughing so as to conserve as much moisture in the soil as possible. For the same reason, weeds should be kept down if they start to come up before it is time for planting. In the case of heavy soils, the first ploughing should be done in autumn so as to allow the frost to help disintegrate the soil.

Sub-soiling, i.e. running a second plough immediately after the first in the same furrow before it is closed, should, if possible, be done in the case of a heavy compact soil, or when there is a " pan " near the surface, or in the case of old lands which have been ploughed for many years to the same shallow depth.

The ground need not necessarily be left very smooth for planting, but this is desirable in order to facilitate cultivation with implements.

" *In situ* " *sowing.*—Trees may be established either by setting out plants raised in the nursery or else by sowing the seeds direct in the land. The latter method cannot, however, be used with certainty in this Province, except with a few kinds. These are the various kinds of wattles, robinia, and some of the pines, e.g. *Pinus pinaster*, of which the seed is very cheap. The best time to sow *in situ* is about January or February when rain can be depended upon. The seeds of wattles and robinia are very hard and usually take a long time to germinate

unless specially treated. They should be soaked in hot water for about a day immediately before sowing, and should be covered after sowing by a light harrowing.

The wattles are not hardy enough to frost in most parts of the Free State, while robinia can be grown cheaply and with more certainty by using plants.

Pinus pinaster can be easily grown by direct sowing in new lands of sandy soil in the better watered districts and shelter belts could be sown with it, but the wood is not good for most farm purposes.

Altogether the method of *in situ* sowing can only be applied to a small extent in Farm Forestry in the Free State, and planting must usually be done.

Raising trees for planting out.—Whether a farmer should purchase his trees or raise them for himself depends on circumstances and particularly on the distance from a nursery or the railway. When transport is easy it will at any rate be less trouble for him to purchase them, but where transport is a long and difficult matter with risk of delays, which may result in the death of the plants, it would be well worth his while to raise them for himself. Raising trees is not at all difficult after a little experience is gained, and it should be quite possible for a farmer or his family to give the small amount of attention required for raising a few thousand plants each year.

It is safest in this country to raise evergreen trees in trays so that they can be planted out without disturbing the soil round the roots. The seed is sown in beds in the ground or in tins, and should only be covered with soil to a depth equal to the size of the seeds. Fine seeds like gums should hardly be covered at all. The beds or tins must be covered with grass to prevent the soil from caking until the seeds have germinated and then lighter shade should be given. When the seedlings are about an inch high they are pricked out into tins or boxes, twenty-five or thirty being usually put in a half paraffin tin, cut lengthwise, and they must then be shaded again for some time till they have taken root again. After this they should be put out in the open and require little more attention except watering. Care must be taken that the roots do not grow through the holes in the bottom of the tins into the soil below, so the tins should be moved periodically and any roots cut off.

If gums are sown in spring they will be ready for planting out the same summer, but most of the conifers, being more slow growing, will not be ready till the following year. Better results are usually obtained with conifers if sown in the summer.

Deciduous trees on the other hand should not be raised in tins, for they can be planted without soil round their roots during winter, when they have lost their leaves. The seeds should be sown in beds, if possible, in spring, and the seedlings left in the beds till the following winter. In the case of a few hardy fast growing kinds such as robinia, the seedlings may then be strong enough to plant out, but with most kinds the seedlings should then be transplanted into rows in well prepared ground and left for one or two years until large enough to plant out, i.e. when two or three or more feet high.

With some kinds such as the common White poplar it is difficult to raise plants in the nursery, and suckers or shoots from the roots of older trees can be taken up in winter and planted out direct. The same method may be used with robinia. If the stems of suckers are long and out of proportion to the roots taken up with them, they should be cut back and fresh shoots will be sent out.

Other kinds of poplars such as the upright Lombardy poplar, and also willows, tamarisk, and several other kinds are best raised from cuttings or slips cut in winter from the branches. Thick cuttings or truncheons will usually strike root if planted out direct, but with cuttings of the usual size, i.e. about half an inch in diameter, it is safest to put them out first in rows in the nursery, keep them well watered till they have formed roots, and to plant them out during the following winter. Cuttings should be about nine inches long, cut with clean cuts just below a bud at the bottom, and just above one at the top. The buds on the lower part should be cut off and the cuttings put in the ground so that only one or two of the buds at the top are out of the ground. Light sandy soil should be used, but it should be pressed firmly round the cuttings.

This method of propagating trees is very simple, and in many parts of the country it is so easy to get cuttings of willows and poplars that it should certainly be tried by farmers who wish to plant up their dongas or vleis or other moist ground.

Planting out.—In the case of deciduous trees, planting out of transplants or rooted cuttings must be done in winter or early spring before the new leaves appear. Although there is no need to have soil with the roots, care must be taken that the roots do not dry out before planting, and a good plan is to put them in buckets of liquid mud till planted. Good holes should be dug, the roots set so that they are not doubled up, and when the hole has been partly filled up, plenty of water should be given and the remaining dry earth put in on top to act as a mulch.

As dry windy weather is likely to follow in spring, which is just the time of the year when deciduous trees require moisture most, it may be necessary to water again until the trees are well established.

Evergreen trees on the other hand should not be planted in winter or even spring unless exceptionally good rains fall, and it is much safest to wait until the summer rains set in, i.e. usually about this time of the year. Planting may be continued to the end of April or even May if the season be favourable, but usually January to the end of March is the best time. At any rate planting should only be done when the ground is moist, and, if possible, it should be done in cloudy weather when more rain is expected, or even while it is actually raining. Otherwise the trees should be well watered immediately after planting, and if hot dry weather follows further watering may be necessary for a few weeks or some months according to circumstances.

The trees should be cut carefully out of the tins by means of a sharp knife, each with its cube of soil which must not be allowed to fall away so as to break and expose the roots. An ordinary garden trowel is all that is needed for planting the small trees from flat trays if the ground has been well prepared, but otherwise a spade should be used.

Espacement for planting.—The espacement or distance at which the trees should be planted from one another depends on the species of tree, especially rate of growth, and the object for which it is planted.

Close planting of trees has many advantages. They shelter each other better from winds, their lower branches die off earlier and growth is straighter and cleaner, they are apt to send their roots down deeper and so be more resistant to drought, and their crowns meet and shade the soil earlier and keep down the weeds, and so cultivation can be

discontinued earlier. Moreover, earlier thinning will be necessary, and this will yield useful material for various purposes.

Conifers and deciduous trees should not be planted more than 4 feet apart to produce timber, and the slower growing gums should be planted at the same distance or 5 feet apart, while the fast growing gums can be planted 6 feet apart.

For purposes of shelter, however, wider distances are permissible, and even desirable when a low dense shelter is required, for the trees will retain their lower branches longer. Thus the faster growing cypresses, such as *Cupressus macrocarpa* and *lusitanica*, may be planted 9 feet apart in the rows with rows 6 feet apart, and the slower kinds such as *Cupressus sempervirens* and *Pinus halepensis* about 8 feet by 4 feet apart, while gums may be planted about 6 by 6 feet to 9 by 9 feet apart according to rate of growth.

Cultivation.—Constant cultivation until the branches meet is most essential in most parts of the country in order to let air into the soil and prevent it from baking, to conserve moisture in the soil by providing a shallow mulch of loose dry soil on the surface and to prevent the growth of weeds, which not only draw much moisture from the soil, but also may actually choke the trees.

For ordinary use, a single horse cultivator is best for keeping the soil loose and taking out small weeds. When the ground has been allowed to get very hard or weeds to grow large, it may be necessary to use a small plough which, however, should be followed quickly by a cultivator to close up the furrows. Whichever implement is used, great care must be taken that it is not allowed to go too close to the trees and so cut the roots or break the branches or cover the small trees with soil, and that the horse or mule does not tramp the trees. In the case of broad plantations, cultivating should first be done in one direction and then in the direction at right angles, the trees being evenly planted so as to allow of this. After cultivating, hand work with Kaffir hoes will usually be necessary in order to remove any weeds that are left, specially immediately round the trees. Sometimes it may be necessary to do all the cultivation by hand work, but whenever possible the more economical method of using implements should be employed. Cultivation should be done as soon as possible after each rain so as to conserve as much moisture as possible.

Blanks.—It is most desirable to fill up blanks where trees have failed in a plantation at the first opportunity so that the plants can catch up with the original ones. With such close planting, as 4 feet by 4 feet, it is not necessary to fill blanks when there are only a few of them, but with wider planting it is always best to fill them up.

Size and arrangement of wind-breaks.—The desirable width of a wind-break depends on the degree to which the situation is exposed to strong winds. One or two rows of trees are sufficient only in situations which are naturally well sheltered or partly sheltered by other wind-breaks. In exposed situations the trees will get bent by the wind and will not reach their full development if only one or two rows are planted, and so a broad belt of at least six rows and preferably ten or fifteen rows should be planted in such situations. The trees will then protect each other and are likely to grow much taller.

When there is plenty of room it will sometimes be better, however, not to plant a broad belt of one kind of tree but to plant a double belt of gums on one side and conifers on the other, leaving an uncultivated space of 20 to 30 feet between them. The quick growing taller gums will thus provide high shelter, while the slower growing more

bushy conifers will keep their branches near the ground longer and break the wind which would otherwise sweep through the bare stems of the gums. A double belt like this is specially desirable for thorough protection for an orchard or cultivated lands, and in that case the conifers should be on the side next to the lands because their roots are not so likely to dry out the soil. On the other hand, when a double belt is used for stock, it is better to have the conifers on the outside and the gums on the inside, so that the animals can get shade under the latter and yet be protected from wind by the former.

The same effect can be obtained to some extent with a single belt of gums by allowing the trees on one side to grow up and cutting off one or two rows on the other side every five years or so. The coppice shoots sent up from these will act as the lower denser shelter.

Care and treatment of plantations.—When the necessity for cultivation has ceased plantations usually do not require much attention for some years.

Pruning is seldom desirable, and if the lower living branches are pruned off, as is sometimes done, it may be harmful by making the trees top-heavy and likely to be bent or broken by wind.

If some of the trees form two leaders it is desirable to cut off the less vigorous one, for a forked stem is very apt to split and does not, of course, give such useful wood as a single straight stem.

If gums suffer badly from frost or drought, so that the stems die back partly from the top or completely down to the ground, it is best to cut them off quickly at the level of the ground. The roots are usually still alive, and will send up fresh shoots or coppice formed from the rising sap which would be wasted in trying to put fresh life into the stems if these are not cut off. If, however, the tops of the trees are still green, even though the leaves are killed, the trees will usually recover and should not be cut off.

This coppicing is sometimes desirable, even when the trees have not suffered from frost or drought but when they are making poor crooked growth. Coppice shoots usually grow not only faster but also straighter than the original stems.

This treatment is possible and sometimes desirable with some deciduous kinds such as robinia as well as gums, but is not possible with conifers. It should be done in winter or as early as possible in spring before the sap begins to rise so that all the latter will go to feed the new shoots.

Thinning.—This consists in the first place of removing badly shaped or sickly trees, and this is all that is required for a good many years in the case of plantations of conifers. With gums, however, thinning at a comparatively early stage (i.e. after five to ten years) is sometimes desirable, both in dry situations in which it is necessary for each tree to have more growing space after a time so as to withstand drought better, and also in moist situations in which the height growth of gums is so rapid that they are apt to become thin whip-sticks if allowed to grow up too close together. Thinning results in faster growth of the stems in diameter, and so will give the farmer a quicker yield of material of the size he desires. Thinning requires, however, experience and great care, otherwise the plantation may be partly ruined. It is a good rule to make only a light thinning at one time. Often thinning may not be necessary at all, because some of the trees have naturally gone ahead of the others and are making stronger growth.

Felling the crop and coppice regrowth.—It will be a long time before young plantations of conifers are ready to be felled and so we will not consider them, but fast growing trees like gums and wattles may be large enough to cut for fuel or reach the size of the comparatively small poles required by farmers, in from six to twelve years. We are already cutting some gums in parts of the Government plantations, established five or six years ago, in order to supply the demand for poles.

As already mentioned, gums and also wattles will grow up again from the stump when cut off, and so a fresh crop is obtained with little trouble. The stems should be cut off almost level with the ground, and it is better if a clean slanting cut is made. Cutting should be done in winter before the sap rises, both for the benefit of the young growth and also because wood cut in winter is more durable than if cut when it is full of sap.

When the farmer does not require to cut all the trees in a plantation of gums or wattles in one year it is much better not to cut out trees promiscuously from the whole plantation, but to cut off all the trees in one part of it and so obtain a uniform regrowth. The next year another part can be cut off and so on.

Several coppice shoots will come up from one stump, and it is best to let them all grow up for a few years so as to protect each other and the soil. When they are large enough to be of use for some purpose such as droppers the weaker ones should be removed, leaving one to about three of the stronger ones to form poles.

The first crop of wood has thus been reaped and the second crop started without difficulty, and the farmer has thus obtained in return for his initial expenditure of money and trouble, a permanent and remunerative improvement to his farm.

In conclusion, I may say that it appears obvious that extensive tree planting on farms in this Province will assist greatly the development of both stock and agricultural farming, and I believe that if you can awaken an interest in the question among the young generation and teach them something of the right methods of tree planting, you will be doing much to promote the prosperity and welfare of the country.

The American Aloe, Century Plant, or Garen-Boom

(*Agave americana*).

By JOSEPH BURTT-DAVY, F.L.S., etc., Government Agrostologist and Botanist (Transvaal).

A GOOD deal of interest is being taken at the present time in fibre plants, as is evidenced by the number of inquiries on the subject received from South African farmers.

Naturally, one of the first things to attract attention is the common American Aloe or Garen-boom (*Agave americana*) which grows so easily and is so often seen on farms almost throughout the country. In early days it was often planted as a hedge around the farm garden, orchard, or small corn-lot. As a hedge it does not seem to be very satisfactory, for when the plant flowers it quickly dies, leaving an unsightly gap through which cattle, donkeys, and mules can easily enter the garden.

Uses of the Fibre.—As the Dutch Colonial name implies, the plant produces a thread-like fibre, which in Mexico, Spain, Sicily, the West Indies, and South America is extracted and utilized in the preparation of cordage, fishing lines, nets, hammocks, mats, imitation horse-hair cloth, and other coarse fabrics, etc. It has also been used in the manufacture of paper, and the peasant women of Fayal manufacture it into lace.

Watt states that the fibre is composed of large filaments and is white, brilliant, and readily separated by friction, that it takes colour freely and easily, is light, and contracts rapidly under water. Spon describes the commercial fibre as being white to straw colour; "its main faults are the stiffness, shortness, and thinness of wall of the individual fibres and a liability to rot."

Samples prepared in the United States are described by Mr. C. R. Dodge as showing a fine, soft, white fibre of more or less brilliancy, a distinctive characteristic being a wavy or crinkled appearance which prevents the bundles of fibres in mass from lying closely parallel, as is the case with Sisal hemp and similar straight fibres. He adds that another marked peculiarity is its great elasticity.

In India this fibre is known as *pita*. Dr. Forbes Royle states that pita has been found superior in strength to either coir, jute, or sunn hemp. In a trial of strength of several fibres made into ropes 2 fathoms long and 3 inches in circumference, the following results were obtained:—

Name of Fibre.	Breaking Strain.
Pita	2519½ lb.
Jute	2456½ lb.
Sunn hemp	2269½ lb.
Coir	2175 lb.

In an experiment with Russian hemp and pita, the former broke under 160 lb. weight as compared with a weight of 270 lb. required to break the pita.

Mr. Dodge, who has made a special study of the various fibre plants of the world, considers that pita fibre is worthy of more extensive cultivation and employment in the arts.

Cultivation.—*Agave americana* is exceedingly hardy, easy of propagation, and can be grown in semi-arid regions, often where scarcely any other cultivated plant can be grown. Although the parent dies after flowering, it produces a large number of shoots from the base, by which propagation can be effected. These require about three years to come to perfection; the plants continue to bear, usually until they are about eight years old and sometimes up to twenty years of age. It is usual to plant 5000 to 6000 plants to an English acre. The average number of leaves is usually forty, each measuring 8 to 10 feet long by about 1 foot wide and yielding 6 to 10 per cent. weight of fibre.

The culture of *Agave americana* is said to be extending in tropical America, " though not in the proportion which its value deserves." It does not appear to be cultivated as a commercial product, either in the United States or in India, the want of a good machine for extracting the fibre having been the principal opposition met with in the numerous endeavours which have been made to start a commercial industry. Improvements are constantly being made in these machines, however, and it is probable one or other of those now on the market may, sooner or later, meet the requirements.

Harvesting and Preparation.—The process of harvesting is somewhat laborious, each leaf having to be cut off separately, carried to the factory, and deprived of spines before it is passed through the machine which removes the " skin " and the watery pulp, leaving the crude fibre ready for subsequent treatment. Owing to the great weight of the leaves and the large proportion of pulp and water contained, they must be treated on the field. In Mexico it is usual to have tramways running through the fields which carry the heavy leaves to the place where the machinery stands. Cheap and efficient labour seems to be a *sine qua non*. Practically all of the Agave fibre of commerce is cleaned by machinery; the different kinds of machines being all similar in principle. Fresh green leaves are fed sideways at the rate of 1000 to 3000 per hour. They are crushed and beaten and the green pulp is scraped away by rapidly revolving drums, against which first one end of the leaf and then the other is pressed by means of adjustable aprons. In some machines streams of water play on the fibre as it passes from the scraping wheels to remove the gummy juice and pulp. From the machine the fibre is taken to the drying yard where it is hung on wire fences, and when dry is baled for market, usually without sorting, as it is fairly uniform in quality.

Other uses of the Agave plant.—*Agave americana* has been successfully used for the reclamation and prevention of dongas and the arrestation of soil erosion.

Wattle Extract and Cutch.

THEIR RELATIVE MERITS FOR TANNING NETS.

A REPORT has been received by the Department of Commerce and Industries by Mr. Bertram Blount, F.I.C., London, on the relative merits of wattle extract and cutch as tanning materials for nets, as deduced from a very comprehensive series of tests carried out by him. As the report will probably be found of interest by those engaged in the wattle industry in South Africa, it is published herewith. Mr. Blount says:—

I have now completed the experiments referred to in my report under this reference number, and dated 3rd October, 1910, designed to ascertain whether the samples of wattle then examined could be used for the treatment of fishing nets in similar manner to cutch, which is commonly employed. The results of this investigation are given below.

The two samples of wattle analysed were found to contain 36.8 per cent. and 37.6 per cent. respectively of tannin stated in terms of crystallized oxalic acid, as against 46.42 per cent. (similarly stated) in the sample of cutch analysed under reference number 325/10, and reported on 28th July, 1910. As mentioned in my report of 3rd October, the tannins in different tanning materials differ in their properties, and direct experiment is necessary to ascertain whether one can be satisfactorily substituted for another known to be serviceable for a given purpose. The method adopted was as follows:—

Pieces of undyed fishing net were tanned with the extract from each of the two samples of wattle and compared with similar pieces of net treated with cutch. The strength of the solution was in all cases adjusted so that they contained the same proportion of tannin, and the process was conducted under identical conditions which are described in the appendix to this report. A specimen of each is sent herewith.

It will be seen that in general appearance and in tint there is but little difference between the samples, though the specimen dyed with cutch is possibly rather browner than those dyed with wattle. In Mr. ——'s letter of 27th August, it is stated that, provided the whiteness of the cotton is toned down, the precise shade obtained is of little importance. In order to ascertain, however, whether a darker tone could be easily obtained, another experiment was made with each of the two samples of wattle, to which a small portion of Bismark brown had been added. The netting thus dyed has a good brown colour in both cases. Samples are sent herewith.

In order to decide whether the tint obtained both by the wattle alone and with the addition of Bismark brown was permanent, pieces of the dyed net were exposed to the action of water, sea water, soap solution, etc., under various conditions, and compared with similar

test pieces dyed with cutch. The observations of their behaviour under these conditions are tabulated below:—

I.—*The test specimens were soaked in fresh water (London tap water), allowed to dry and re-soaked, the operation being repeated ten times in fifteen days*:—

Wattle Sample A	Unaffected.
Wattle Sample A + Bismark Brown ...	Very slightly lighter.
Wattle Sample B	Unaffected.
Wattle Sample B + Bismark Brown ...	Scarcely affected.
Cutch	Unaffected.

II.—*The specimens were soaked in sea water and allowed to dry, the operation being repeated ten times in fifteen days*:—

Wattle Sample A	Unaffected.
Wattle Sample A + Bismark Brown ...	Very slightly lighter.
Wattle Sample B	Unaffected.
Wattle Sample B + Bismark Brown ...	Scarcely affected.
Cutch	Unaffected.

III.—*The specimens were boiled in fresh water during the day (about eight hours), allowed to cool in the water overnight, and re-boiled, the series of operations being thus carried out for fifteen days*:—

Wattle Sample A	Unaffected.
Wattle Sample A + Bismark Brown ...	Considerably lighter.
Wattle Sample B	Very slightly lighter.
Wattle Sample B + Bismark Brown ...	Considerably lighter.
Cutch	Slightly lighter.

IV.—*The specimens were boiled in sea water during the day, allowed to cool in the water overnight, and this treatment repeated for fifteen days*:—

Wattle Sample A	Slightly darker.
Wattle Sample A + Bismark Brown ...	Very little affected.
Wattle Sample B	Slightly darker.
Wattle Sample B + Bismark Brown ...	Very little affected.
Cutch	Slightly yellower.

V.—*The specimens were boiled in strong soapy water during the day and allowed to cool in the water, the operation being repeated for fifteen days*:—

Wattle Sample A	Appreciably duller.
Wattle Sample A + Bismark Brown ...	Considerably lighter.
Wattle Sample B	Appreciably duller.
Wattle Sample B + Bismark Brown ...	Considerably lighter.
Cutch	Appreciably duller.

VI.—*The specimens were exposed on glass plates on a roof in London, to sun, air, and rain, for fifteen days. The weather was variable and moderately warm*:—

Wattle Sample A	Somewhat lighter.
Wattle Sample A + Bismark Brown ...	Slightly lighter.
Wattle Sample B	Somewhat lighter.
Wattle Sample B + Bismark Brown ...	Slightly lighter.
Cutch	Slightly lighter.

Regarding these results as a whole, it is evident that the specimens dyed with each of the samples of wattle resist the action of fresh and salt water, hot and cold, and of soapy water, and of the weather, as well as does the specimen dyed with cutch.

In order to ascertain whether a bath made with wattle would suffice to treat a similar quantity of cotton netting as can be treated by the same amount of cutch, the following mode of testing was adopted:—

Baths were prepared from each of the samples of wattle and from the cutch, of such strength that they all contained the same quantity of tannin, and in these weighed pieces of netting were tanned, the process being continued with fresh pieces of netting until the baths showed signs of exhaustion.

The total increase of weight is a measure of the amount of tanning effect which can be obtained from each of the three materials, and may be conveniently compared by taking the weight absorbed from the cutch bath as 100:—

Cutch	100
Wattle Sample A	109
Wattle Sample B	98

Wattle Sample B closely approaches the cutch in respect of the quantity of netting which a bath containing the same quantity of tannin will take, and Wattle Sample A actually exceeds it.

Conclusion.—As a result of this investigation I have arrived at the following conclusion:—

The two samples of wattle examined contain respectively 36.8 per cent. and 37.6 per cent. of tannin (calculated as crystallized oxalic acid) as compared with 46.42 per cent. in cutch, stated in the same manner. Baths prepared from each of the two samples tan cotton netting to the same shade as that obtained with cutch, and the colour is equally resistant to fresh water, sea water, weather, and similar influences tending to cause it to fade. The amount of tanning material which a bath of given strength will yield is practically the same as that yielded by a bath prepared with cutch. There is no indication of injury or tendering of the fabric of the net, and it is reasonable to suppose that the protective effect of the process will be similar with the two materials, but practical experience alone can decide this point with certainty. I am of opinion that the results of this inquiry amply warrant the trial of wattle as a tanning and colouring material for nets on a working scale.

Further Notes on Game Preservation.

By H. N. DEVITT, Pretoria.

IN my last article published in the *Transvaal Agricultural Journal* for July, 1909, and which perhaps some readers may not have noticed, I gave certain factors which, in my opinion, militate against the existence or increase of game in our Province. For the sake of convenience I therefore enumerate them again. They are:—

(*a*) *Natural Causes*—
- (1) Excessive rainfalls.
- (2) Natural enemies.
- (3) Grass and bush fires.
- (4) Diseases.

(*b*) *Human Agencies*—
- (1) Natives and native dogs—
  - (i) Individuals.
  - (ii) Hunting parties.
- (2) Europeans—
  - (i) Licensed.
  - (ii) Unlicensed.

Of the first class one of the most potent causes—if not the most potent cause—of destruction is the natural enemies. Of these, in view of the fact that some interest appears recently to have been awakened in the subject through the labours of the well-informed correspondents on game matters to certain daily papers, I propose shortly to treat. To go fully into the subject requires long and careful study, practical and otherwise, to do it justice. I only hope to touch the fringe.

The natural enemies of our game are, of course, divisible into winged and—for want of a better term—ground. Of the former, eagles, falcons, hawks, and secretary birds are generally credited with doing a certain amount of damage. In some parts of the country most of these birds are found in goodly numbers, in others again they are not. I was much surprised during two trips taken last winter to the Northern Transvaal—one to the Waterberg and the other to the Zoutpansberg—to find in the parts which I visited a marked scarcity of hawks. The reason, however, was, to my mind, not far to seek. Compared with many areas I found an equal scarcity of partridge, hare, and korhaan (except the bush species), although guinea-fowl were there in thousands. In parts of the Western Transvaal, on the other hand, both partridge and hare are quite plentiful. Up to two years ago it was not uncommon for a man to bring back twenty brace of redwing in a day's shoot, and here hawks abounded.

It has often been a matter for surprise to me that certain of these birds of prey have not had prices put upon them. There are two which are notoriously inimical to a farmer's property, the lammervanger and the kuikendief, and no doubt more trouble would be taken

to shoot them if paid for. How many could not be exterminated by travellers along country roads in open country where telegraph poles so often form the lookout posts of these birds?

The handsome secretary bird is found in pairs widely distributed over the country. Years ago the Natal Government protected them on the ground that they were destroyers of snakes. This is no doubt the case, but at the same time they are generally credited—rightly or wrongly—with being very partial to the young of game; and when one remembers that snakes are not often found above ground in the winter months one is forced to the conclusion that these birds must eat the smaller game in addition to their other fare of mice, spiders, and other creeping things.

Of the four-footed enemies to game—besides lions and leopards—tiger cats, hyaenas, jackals, the smaller wild cats, certain of the weasel family, and probably certain snakes, are inimical to their welfare. Few of these smaller animals are seen by day and they are consequently difficult to locate. I suppose that more jackals are killed in the Transvaal by poison than are shot. To encourage their destruction the Government has been in the habit of paying rewards for the production of their skins at the magistracy of the district within which they have been killed. Advantage is taken of this system by many farmers and others, and the number of skins so surrendered annually must be considerable. The principle is a good one, though it would seem that its application might in some respects be amended with advantage. For instance, rewards of 5s. and 2s. 6d. per head respectively are paid for the destruction of what are called the red and the silver jackals. Now there do not appear to be any of the jackal family correctly called "red" jackals. The one intended, thought to be the most destructive of them all, is the "black-backed" or "saddle-backed" jackal, whose only claim to be called red is the possession of certain red hair on the lower parts of its body. This animal is frequently taken by many people for the silver jackal, as the upper skin or saddle carries a mixture of whitey-black hair having a silvery appearance. It is the handsomest of all the jackals. The true silver jackal has also a silvery appearance, but is nearly of one colour all over. It is not so harmful a creature as the other. It is for this one the lesser reward is offered. Then another, the side-stripe jackal (grijze jakhals) of a brawny-grey colour, is as mischievous as number one, and its slayer should receive the higher reward.

Two other species, the maanhaar and the draai jakhals, are no doubt frequently paid for after death, but as a matter of fact are believed to be practically harmless. I once shot one of the "draai" species, not knowing of its innocent ways; it is of a browny-red coat; I concluded it was a true "red" jackal. I was wrong, however, and so was the official who paid me 5s. for its skin.

Rewards are not now paid for the skins of the more rapacious of the smaller cats such as the serval, lynx, rooikat, and genets. Either of the two first named should, if paid for, be worth at least £1 in the killing. They are both dangerous to small stock and small buck, and would give a dog a very bad time in the getting at them.

The most destructive animal to game is undoubtedly the wild dog (*Canis pictus*). The reward offered for his destruction is £1, and for reasons I will endeavour to explain I think this sum is inadequate.

To begin with, I suggest that the principle underlying the payment of these rewards should be the following:—

(1) Allocate the highest reward for the destruction of (*a*) the most destructive creature, and (*b*) that which is the most difficult to find and kill and vice versa.

(2) So to adjust rewards that they do not operate merely as gratuities to those who, either by a fortuitous circumstance or in pursuance of the protection of their flocks and herds, have killed what is called "vermin", but that it should pay people to hunt these undesirables as a calling and to earn a living thereby.

(3) To adjust the rewards also with due regard to the damage "vermin" do (*a*) to flocks and herds, and (*b*) to game, small and large.

If No. 1 be a correct view, I think most people will agree that the worst enemy the buck have in the Transvaal is the wild dog. Except in the northern confines of the Province and in the game preserves, the lion is practically unknown and the leopard rare, and I therefore do not propose to treat of them. Writers on the game of Southern Africa have all more or less expressed the same views about the wild dog as those held to-day, although few of them say much about him.

F. C. Selous, in one of his several works, tells us that these animals are seldom come across: that during the best part of two years spent in hunting over Mashonaland and Matabeleland he only met them twice. It appears that they breed in holes, and, if discovered when with young, they move off to other parts without delay. As regards their methods of hunting a most interesting description is given by the Hon. J. R. Drummond in his delightful book "The Large Game of South Africa", published in 1875, after eight years hunting alone with natives, and without tent or modern conveniences, in the country lying between Delagoa Bay and the Pongolo River. I give the writer's experience in his own words. He says:—

"Among the flocks and herds there is no animal whose ravages are more dreaded than those of the wild dog. It is a marvellous sight to see a pack of them hunting, drawing cover after cover, their sharp bell-like note ringing through the air, while a few of the fastest of their number take up their stations along the expected line of the run—the wind, the nature of the ground, and the habits of the game all taken into consideration with the most wonderful skill—and then to see them after they have found going at their long unswerving gallop, so close together that a sheet might cover them, while those which had been stationed or had stationed themselves (it is hard to say which) drop in one by one as they find themselves unable to make the running any longer. And the chase, generally a gnu or a water-antelope, pressed first by one and then another, though it may distance the pack for a while, soon comes back to it and is in the end almost invariably run into. The only thing to which I can compare these animals and their instinct, as people call it, is a pack of hounds hunted and whipped in by members of their own body, and combining in one human reason and brute cunning and power."

The writer goes on to give a most interesting account of one of these hunts which he witnessed, but which is too long to quote *in extenso* here. It is to be found on page 312 of his work. The foregoing may remind some readers of an incident of the kind portrayed in "Jock of the Bushveld" (Fitzpatrick).

It will therefore be seen that these wild dogs are a strong factor in keeping down the increase of buck. Another point is that their only habitat is where the buck are more or less plentiful; still, when on their raids, they may be found miles away at times. There is little doubt but that they breed in those parts where they have small trouble in feeding their young—in the reserves and elsewhere—making periodical excursions inland. While shooting last winter with friends west of the Warmbaths in the Waterberg we were surprised at the paucity of buck in a part where they had been most numerous. On our return to camp we found the police had passed through, leaving word that a pack of wild dogs were scouring the country-side and that two had been shot on the adjoining farm the previous day. This pack must have come a long distance, as in those parts they would be too quickly exterminated for them to last long. A few years ago, whilst magistrate at Piet Retief, some native youths were brought before me for killing a koodoo, which is protected game. They had found it in an exhausted condition from running at a place west of the western border of the Pongolo Reserve, whence it had been chased by wild dogs. The latter had been hunted off by the natives, who followed and dispatched the koodoo. No koodoo had been seen in that part during this generation, so the buck had in all probability run from 20 to 30 miles to escape his pursuers.

Seeing, therefore, the number of buck these dogs must destroy, and the unrest they cause in the buck world generally, it would appear that the present reward is too small. £2, or even £3, per head is, in my opinion, a reasonable amount to pay. But there is one fact which should not be overlooked. If, as seems to be the case, packs visit us from adjoining territories such as Swaziland, co-operation with the authorities in those areas is essential. A uniform reward should, therefore, be fixed upon and paid all over Southern Africa beyond as well as within the Union to have effective protection. If this be not done the Transvaal Province may go on paying rewards for the destruction of creatures produced in adjoining areas where no price is put upon them, the administration of the Game Laws coming under the Provincial Councils.

It would be interesting for the purpose of comparison if the figures relating to vermin destruction were obtained and published each year by the Game Protection Association, so that those interested in the matter could learn exactly what was being done in each district in regard to it.

I have already referred to the tiger, bushcat, and the lynx. There are, however, some of the smaller species which, although it is hard to discover the extent of their several depredations, and though they do no damage to the farmer except among his poultry, no doubt destroy game. They are carnivorous and consequently must live off the veld, and therein quite possibly do as much damage as jackal.

I have put down snakes as being inimical to game. But I only suggest that this is so as regards the egg-eating species, which, as some of them can manage whole fowl eggs, are capable of demolishing the contents of many nests of feathered game.

Merino Sheep and Sheep Breeding.

HOW TO TREAT SHEEP AND THEIR WOOL FOR MARKET.

Lecture delivered by Mr. C. MALLINSON, Flockmaster and Wool Expert (Transvaal), at Dullstroom and Machadodorp on 5th and 6th January, 1911.

MR. MALLINSON said he was addressing his audience as a practical sheep farmer, having himself been one for a number of years in Australia. As a professional man he had thirty-two large flocks under his supervision when he left that country. He merely mentioned this to impress upon them that he was not going to base his talk on theory but upon practical knowledge.

In the course of his lecture he presumed that all present were practical sheep farmers or interested in sheep, and that they would like him to explain to them what is a good sheep, how to breed it, and how to look after it.

The good woolled sheep should have a rather short broad head, short thick neck, wide chest, with a good dew-lap or fold ; he should be broad across the wither, right along the back, with good thighs and forearms, round ribs, and deep in girth, with straight legs, and not too short or too long in the body. This well-built pony-like appearance is easy to keep, and such animals will live and do well where most sheep would die.

Covering.—The wool should be at least two inches long at shearing-time, when there should be twelve months' growth, though a three-inch staple would be better. The wool must show a distinct serration or crimp right from the skin to the tip, with rather a blocky tip, and should be as even as possible all over, including the belly and points. Length should be one of the principal points, not forgetting density.

Breeding.—In his opinion ewes should not go to the ram under two years old. The reason for this is if one breeds from a ewe under two years one is breeding from an undeveloped animal, and if the dam is undeveloped how can one expect the progeny to be developed ? This is one of the principal points in regard to keeping up the constitution.

The sheep farmer should therefore collect all his two-year-old sheep before shearing, bring them into a kraal or yard, and class them. Classing means taking out all the inferior ones—that is those sheep that do not come up to a certain standard, always keeping in the mind's eye the good-framed sheep described above. Once you have constitution and frame it rests entirely with the sheep farmer what kind of wool he desires to cover his sheep with.

In order to obtain the desired covering the following good points must be observed :—See that they have a good sound back, which is most important ; wool of a fair combing length, say at least two inches long ; and good on top of wither, that is, the wool must stand straight up and not lie down. It must show a good, distinct, well-defined serration or

crimp. Wool on any part of the sheep not showing this style is faulty, whether it be on the points of the arm, britch, belly, or any other part of the sheep.

The best way to grow the wool which the farmer thinks will be the most profitable is to mate up the classed ewes with the kind of wool on them he wishes to grow. He knows it would be impossible to get just the ideal, either in frame or wool, or both ; but there is such a thing as getting as near to it as possible, and that should be the aim of every sheep breeder.

The farmer should always try, every year when classing, to get a little nearer to that model sheep he has in his mind's eye. There are no perfect sheep, at any rate he never saw one. For instance, if the farmer wants more length or density, combined of course with a good style of wool, he must select the ewes showing the characteristics which he wishes to propagate. He should also be careful in selecting the ram for these ewes and see that this animal is of the same breeding, and as near perfection as possible, not showing any of the faults it is wished to avoid. Much care is needed here, because the progeny when grown up will show the faults to a very much greater degree than either dam or sire. He maintained that it was absolutely wrong to buy a ram of another breed to correct faults in one's own ewes. This must be done by a ram of the same breed if one wishes to become a successful sheep farmer. He thinks a true sheep breeder will stick to his type wherever he is, and will allow the climatic conditions to do the altering.

A strong constitutioned sheep will do well anywhere in any country fit for Merino sheep. In proof of this see how well the Tasmanian, Boonoke, Wanganella, and South Australians have done under varying climates and conditions in Australia and in other countries.

It should be the object of the sheep farmer to keep his sheep in a good uniform condition, or as near to it as possible, throughout the whole year. If they are not kept in a good uniform condition the wool will suffer more or less, consequently the farmer's pocket.

Fencing.—To keep the sheep in the above-mentioned condition it is absolutely necessary to fence. Not only the farm boundary must be fenced but the farm must be divided into various paddocks, so that it can be worked to the very best advantage, and not let the farm work the farmer, as in too many instances is at present the case. Another essential is giving sheep good clean water, such as one would drink oneself, and plenty of good sheep lick. Dirty pools of water should be drained and made fit to drink by using white unslaked lime in them three or four times a year.

Farmers would very soon find that by using unslaked lime in these dirty pools and keeping a plentiful supply of a good sheep lick (the recipe for which can be had from the Stud Sheep Farm at Ermelo), diseases such as worms, fluke, etc., would very soon disappear ; at least he (the speaker) had found it so.

Shearing.—After a farmer has gone to the expense and trouble of breeding good sheep and growing good wool, it seems absolute folly and a waste of time if he does not see to the proper shearing of his sheep and get-up of his wool. The farmer should be very careful to shear in a clean place so that no foreign matter gets into the wool. In order to get wool up in a marketable condition it is very necessary that wool tables should be fitted up, so that when the shearer has finished shearing a sheep

the fleece can be properly picked up and spread on the table with the staple side up, or what his hearers would perhaps call the outside of the wool. Great care should be taken in skirting, the dirty and inferior edges of the fleece only should be taken off. If the fleece is burry or grass-seedy it is necessary to skirt deeper, so that the fleece may be perfectly free from burry points, burrs, and grass seeds.

After a fleece has been properly skirted it should be rolled up, not tied in any way, and put into a wool bin which is made for that purpose. In classing small flocks it is very necessary to avoid making too many sorts or classes. Two classes of fleeces should be sufficient, say first and second. The first could be branded thus :—A.A. fleece ; the second, A. fleece. Any other fleece which was not good enough to come into the A. quality would be better broken up and put into the pieces. The pieces or skirtings which have been taken off the fleece should be sorted on a table similar to the wool-rolling table. In sorting pieces all the dirty edges or trimmings should be taken off, which would then form a second sort.

The first pieces should consist of all the bigger and cleaner wool. But it should be very distinctly understood that any bits of wool stained with urine and dung must be kept by themselves, for the simple reason that the manufacturer cannot use this stained wool for the same purpose as he uses the white wool.

In a well-managed wool shed there are separate wool bins for each of the sorts mentioned above. The object of the wool bins is to enable the wool classer to see the wool in the bins after it is classed, so that if there is anything wrong he can put it right before it is pressed. When any of the bins are full of classed wool the presser takes and places it carefully in the press. In order to class wool properly it is very necessary to have a good light.

Before Mr. Mallinson closed he remarked that there are several great drawbacks to the Sheep Breeding and Wool Industry of the Transvaal. Among these are scab, Persian and Bastard sheep. The latter he found take scab, worms, etc., more readily than any other sheep he knew of.

The other drawbacks are non-fenced farms and the dirty pools of water the sheep have to drink. Before the Transvaal is able to take its proper place among the wool-growing countries of the world the above-mentioned drawbacks will have to be rectified.

The Chemical Composition of Milk in the Eastern Districts of the Cape Province.

By J. MULLER, B.A., F.C.S., Public Analyst, Grahamstown.

(Read before the Cape Chemical Society on Friday, 26th August, 1910.)

THE latest compiled information on the composition of milk in the Cape Province is contained in a paper by Mr. Sinclair, "The Chemical Composition of Milk in the Cape Colony", read at the Bloemfontein meeting of the South African Association for the Advancement of Science, and published in the *South African Journal of Science* of January, 1910, which is a fair refutation of the statement often made that the standards adopted by public analysts in the Cape Province are too high.

From the data given in that paper it will be noticed that the milks have, more or less, been wholly drawn from the Western District and more particularly from the Cape Peninsula, but that as far as the Eastern Districts go there are at present no published data. In order to compare the quality of the milk as supplied to the consumer in the two sections of the Cape Province I subjoin the monthly averages of all milks passed as genuine in this laboratory (with the exception of two abnormally rich milks) during the period 1903-1910.

They are as follows:—

TABLES OF AVERAGES.

MONTHLY AVERAGES FOR 1903.

Month.	Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
		%	%	%	%	%
May............	2	1·0324	12·68	3·68	9·00	87·32
June............	4	1·0334	13·95	4·55	9·40	86·05
July............	8	1·0335	13·27	3·93	9·34	86·73
August..........	4	1·0313	12·58	3·84	8·74	87·42
September.......	6	1·0310	13·13	4·15	8·98	86·87
October.........	4	1·0324	12·90	3·86	9·04	87·10
November........	6	1·0312	13·35	4·50	8·85	86·65
December........	7	1·0314	13·05	4·20	8·85	86·95
AVERAGES....	41	1·0322	13·12	4·09	9·03	86·88

MONTHLY AVERAGES FOR 1904.

Month.	Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
		%	%	%	%	%
January..........	7	1·0314	13·79	4·84	8·95	86·21
February..........	3	1·0305	13·27	4·57	8·70	86·73
March............	9	1·0311	13·62	4·75	8·87	86·38
April.............	7	1·0310	14·04	5·10	8·94	85·96
May..............	3	1·0324	13·57	4·43	9·14	86·43
June.............	6	1·0316	13·77	4·75	9·02	86·23
July..............	8	1·0315	13·19	4·30	8·89	86·81
August...........	Nil	—	—	—	—	—
September........	5	1·0315	12·63	3·83	8·80	87·37
October..........	5	1·0324	13·70	4·55	9·15	86·30
November........	6	1·0307	12·92	4·24	8·68	87·08
December........	3	1·0328	13·95	4·67	9·28	86·05
AVERAGES..	62	1·0316	13·49	4·55	8·94	86·51

MONTHLY AVERAGES FOR 1905.

Month.	Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
January..........	6	1·0312	13·13	4·32	8·81	86·87
February.........	2	1·0314	12·78	3·99	8·79	87·22
March............	14	1·0312	13·46	4·59	8·87	86·54
April............	13	1·0317	13·27	4·30	8·97	86·73
May..............	6	1·0293	13·56	5·06	8·50	86·44
June.............	1	1·0307	13·62	4·83	8·79	86·38
July..............	7	1·0280	12·28	4·28	9·00	86·72
August...........	2	1·0311	13·87	4·87	9·00	86·13
September........	Nil	—	—	—	—	—
October..........	1	1·0306	13·48	4·75	8·73	86·52
November........	10	1·0329	14·20	4·84	9·36	85·80
December.........	4	1·0322	13·21	4·19	9·02	86·79
AVERAGES..	66	1·0314	13·45	4·54	8·89	86·57

MONTHLY AVERAGES FOR 1906.

Month.	Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
January..........	Nil	—	—	—	—	—
February.........	3	1·0317	13·10	4·19	8·91	86·90
March............	2	1·0307	13·80	4·99	8·81	86·20
April............	5	1·0319	12·95	4·02	8·93	87·05
May..............	8	1·0322	13·34	4·28	9·06	86·66
June.............	3	1·0330	13·00	3·83	9·17	87·00
July..............	Nil	—	—	—	—	—
August...........	8	1·0327	13·38	4·19	9·19	86·62
September........	5	1·0325	12·81	3·77	9·04	87·19
October..........	4	1·0318	13·39	4·38	9·01	86·61
November........	6	1·0327	12·42	3·40	9·02	87·58
December.........	15	1·0317	12·39	3·58	8·81	87·61
AVERAGES..	59	1·0321	13·05	4·06	8·99	86·95

MONTHLY AVERAGES FOR 1907.

Month.	Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
			%	%	%	%
January..........	8	1·0320	12·98	4·04	8·94	87·02
February.........	4	1·0331	13·45	4·18	9·27	86·55
March............	1	1·0317	12·50	3·70	8·80	87·50
April............	5	1·0333	13·82	4·46	9·36	86·18
May..............	4	1·0346	15·34	5·46	9·88	84·66
June.............	1	1·0308	12·90	4·20	8·70	87·10
July.............	1	1·0322	13·30	4·25	9·05	86·70
August...........	19	1·0310	12·80	4·07	8·73	87·20
September........	3	1·0314	12·64	3·90	8·74	87·36
October..........	5	1·0325	11·98	3·07	8·91	88·02
November........	1	1·0327	12·53	3·50	9·03	87·47
December.........	1	1·0317	11·85	3·15	8·70	88·15
AVERAGES..	53	1·0323	13·01	4·00	9·01	86·99

MONTHLY AVERAGES FOR 1908.

January..........	8	1·0305	13·70	4·91	8·79	86·30
February.........	1	1·0329	14·30	4·95	9·35	85·70
March............	4	1·0301	14·08	5·35	8·73	85·92
April............	1	1·0313	13·56	4·65	8·91	86·44
May..............	7	1·0313	13·64	4·73	8·91	86·36
June.............	3	1·0323	14·78	5·49	9·29	85·22
July.............	2	1·0302	14·29	5·50	8·79	85·71
August..........	2	1·0324	13·11	4·05	9·06	86·89
September........	3	1·0334	12·86	3·63	9·23	87·14
October..........	3	1·0320	13·79	4·70	9·09	86·21
November........	3	1·0299	13·51	4·90	8·61	86·49
December.........	Nil	—	—	—	—	—
AVERAGES..	37	1·0313	13·78	4·80	8·98	86·22

MONTHLY AVERAGES FOR 1909.

January..........	Nil	—	—	—	—	—
February.........	Nil	—	—	—	—	—
March............	Nil	—	—	—	—	—
April............	1	1·0338	13·66	4·20	9·46	86·34
May..............	7	1·0314	13·17	4·30	8·87	86·83
June.............	14	1·0324	13·56	4·41	9·15	86·44
July.............	15	1·0311	13·57	4·70	8·87	86·43
August...........	14	1·0342	13·97	4·38	9·59	86·03
September........	6	1·0318	13·45	4·46	8·99	86·55
October..........	10	1·0317	13·51	4·52	8·99	86·49
November........	2	1·0309	13·57	4·75	8·82	86·43
December.........	8	1·0325	13·03	3·96	9·07	86·97
AVERAGES..	77	1·0322	13·50	4·41	9·09	86·50

MONTHLY AVERAGES FOR 1910.

Month.	Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
		%	%	%	%	%
January..........	8	1·0317	13·30	4·35	8·95	86·70
February.........	18	1·0292	12·40	4·13	8·27	87·60
March............	4	1·0314	13·72	4·75	8·97	86·28
April............	9	1·0316	13·65	4·68	8·97	86·35
May..............	3	1·0315	13·74	4·77	8·97	86·26
AVERAGES..	42	1·0311	13·36	4·53	8·83	86·64

SUMMARY OF YEARLY AVERAGES FOR PERIOD 1903-1910 (MAY).

Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.	Period.
	%	%	%	%	%	
41	1·0322	13·12	4·09	9·03	86·88	1903—May to Dec.
62	1·0316	13·49	4·55	8·94	86·51	1904—11 months.
66	1·0314	13·43	4·54	8·89	86·57	1905—11 months.
59	1·0321	13·05	4·06	8·99	86·95	1906—10 months.
53	1·0323	13·01	4·00	9·01	86·99	1907.
37	1·0313	13·78	4·80	8·98	86·22	1908—11 months.
77	1·0322	13·50	4·41	9·09	86·50	1909—9 months.
42	1·0311	13·36	4·53	8·83	86·64	1910—5 months.

The average therefore for the 7½ years is as follows:—

Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.
	%	%	%	%	%
437	1·0318	13·34	4·37	8·97	86·66

It will be noticed that in no case do the monthly averages fall below the adopted limits (3 per cent. of fat and 8.5 per cent. for solids, not fat), in fact as far as the eastern part of the Cape Province is concerned these standards are in reality too low to form a basis for calculating the amount of adulteration in samples so treated.

For comparison I append the following yearly averages for milks in the Western Province from Mr. Sinclair's pamphlet and the senior analyst's annual reports:—

WESTERN PROVINCE MILK.

SUMMARY OF YEARLY AVERAGES FOR PERIOD 1907-1909.

Number Analysed.	Specific Gravity.	Total Solids.	Fat.	Solids, not Fat.	Water.	Year.
	%	%	%	%	%	
491	1·0312	12·36	3·69	8·67	87·64	1907
1007	1·0313	12·56	3·84	8·74	87·44	1908
903	1·0312	12·56	3·85	8·71	87·44	1909

AVERAGES FOR THREE YEARS.

2401	1·0312	12·49	3·79	8·70	87·50	1907-09

Arsenical Poisoning through Medium of Milk Imbibed at Mother's Breast.

By J. MULLER, B.A., F.C.S., Public Analyst, Grahamstown.

(*Read before the Cape Chemical Society on Friday, 26th August, 1910.*)

DURING April, 1904, a native woman near Lusikisiki, in the Transkei, drank some coffee prepared by a trio of visitors to her kraal ; the latter, it appears, added some white powder to what was left of the decoction after they had partaken of it themselves prior to their departure.

Shortly after drinking the coffee the woman suckled her infant child (3-5 months old) at her breast. The child very soon took ill and vomited violently, and died in convulsions within an hour and a half. The woman and some other inmates of the hut who had drunk of the same decoction became sick in a similar manner, but recovered with no further injurious results.

The District Surgeon in his post-mortem report stated that he examined the mother of the dead child and found her in a very weak condition, temperature a little over 100°, pulse 120, her heart irregular and fluttering. The body of the infant was in a good state of preservation, and seemed to have been well nourished. Some thick white fluid, evidently digested milk, was oozing from the nostrils and mouth. The stomach and intestines all showed symptoms of inflammation, *intra vitam*, which was specially marked in the stomach itself, where the mucous membrane was swollen, thickened, and highly congested throughout.

The contents of the stomach were tinged with blood, and were of the same appearance as the fluid above described as issuing from the mouth. The liver was enlarged, dark in colour, and hard ; the spleen also enlarged, and the mesentereal lymph glands swollen. The kidneys and bladder appeared to be normal. The heart contained a little dark liquid blood. The remaining organs were apparently normal.

The following exhibits were collected by the District Surgeon and forwarded to me for analysis, with the following results :—

(1) The undissolved powder found as sediment in the coffee-pot contained 2.336 grammes of arsenious oxide ;

(2) portion of contents of stomach of deceased infant weighed one-quarter of an ounce, and was found to contain 31-32nds of a grain of arsenious oxide ;

(3) pieces of liver and spleen, also of stomach, removed from body of deceased infant, weighed 3 ounces, and were found to contain nearly one-quarter of a grain of arsenious oxide.

From the records of the preliminary examination taken against the three natives (charged with having made the poisoned coffee) it is quite clear that at no time prior to death was any of this coffee administered directly to the infant. If the latter had been the case the amounts of the arsenic found in the organs would have been considerably more. Consequently from the symptoms reported and the above analytical data death of infant appears to have resulted by the transmission of arsenic through the medium of milk imbibed from its mother, who at the time was suffering from arsenical poisoning.

Milk Records.

ELSENBURG COLLEGE HERD.

THE following milk records, for the months of December and January, of the dairy herd at Elsenburg Agricultural College, Cape Province, will doubtless prove of interest to readers not only in the Cape Province, but elsewhere in the Union. The practice has been to publish these monthly records in the *Cape Agricultural Journal*, and it is hoped to continue to do so in the pages of this journal.

MILK RECORD TO 31ST DECEMBER, 1910.

Breed and Cow.	Days in Milk.	Yield in Lb.		
		During December.	Total to Date.	Daily Average.
FRIESLANDS.				
Beauty	340	444	7452	21·9
Victoria	288	400	6730	23·3
Cleopatra	252	418	7226	28·6
Romula	208	396	4081	19·6
Violet	186	566	5342	28·7
Vera	164	619	4678	28·5
Belladonna	140	699	4386	31·3
Rose	106	862	4108	38·7
Bell	35	1118	1294	36·9
Veronica	12	362	362	30·1
JERSEYS.				
Gertie	265	162	3958	14·9
Gwendolen	246	385	4544	18·4
Grace	239	438	4460	18·6
Gladys	239	341	3971	16·6
Gus...	197	482	3910	19·8
Petunia	179	353	2997	16·7
Gilliflower...	175	473	3779	21·5
Fanny	164	465	3499	21·3
Evelyn	122	385	1915	15·7
Glee	105	676	2794	26·6
AYRSHIRES.				
Lobelia	186	494	4166	22·4
Queen Dot...	128	537	3234	25·2
SHORTHORNS.				
Maggie	528	86	8696	16·4
Helen	102	343	1352	13·2
CROSSES.				
Bessie	208	770	7594	36·5
Disa	197	719	5597	28·4

MILK RECORD TO 31ST JANUARY, 1911.

BREED AND COW.	DAYS IN MILK.	YIELD IN LB.		
		During January.	Total to Date.	Daily Average.
FRIESLANDS.				
Beauty	371	433	7885	21·2
Cleopatra	283	392	7618	26·9
Romula	239	407	4488	18·7
Violet	217	585	5927	27·3
Vera	195	666	5344	27·4
Belladonna	171	685	5071	29·6
Rose	137	966	5074	37·0
Bell	66	1057	2351	35·6
Veronica	43	908	1270	29·5
Boerin	16	315	315	19·6
JERSEYS.				
Gertie	281	67	4025	14·3
Gwendolen	277	467	5011	18·0
Gladys	270	393	4364	16·1
Grace	270	467	4927	18·2
Gus...	228	509	4419	19·3
Petunia	210	328	3325	15·8
Gilliflower...	206	416	4195	20·3
Fanny	195	469	3968	20·3
Evelyn	153	347	2262	14·8
Glee	136	698	3492	25·6
AYRSHIRES.				
Lobelia	217	468	4634	21·8
Queen Dot...	159	557	3791	23·8
SHORTHORN.				
Helen	133	372	1724	12·9
CROSSES.				
Bessie	239	811	8405	35·1
Disa	228	725	6322	27·7

The following are the average percentages of butter fat of the breeds of cattle at Elsenburg :—

Friesiands	3·05 per cent.
Jerseys...	4·83 „
Ayrshires	3·90 „
Shorthorns	3·90 „

A Fruit and Wine Farmers' Union.

WHAT THE WESTERN PROVINCE FARMERS ARE DOING.

THE fruit and wine farmers of the Western Province of the Cape are taking a step which should go a considerable way towards improving their position and prospects generally. They are banding themselves into an association that is to be styled the Western Fruit and Vine Growers' Co-operative Union, and which is to have for its object the furtherance of all interests of such growers. The interests involved are of the widest, and, according to the prospectus, include, *inter alia* :—

(*a*) The distribution of information relating to South African, European, and American markets ; and the recommendation of reliable agents for these markets.

(*b*) The negotiation of freights and the allotment of space in ships' cool chambers for export fruit. To supervise the cold storage, shipment, and all matters relative to the export trade.

(*c*) The ventilation of all grievances affecting the industry, with a view to their removal. The power to take up and prosecute in court, if necessary, cases in which individual members of the Association have suffered loss through the dishonest or illegal action of other parties, or through unjust restrictions imposed upon the industry.

(*d*) The power to organize deputations, and pay the expenses of same, should it be found necessary and advisable to make such deputations from time to time to the various Ministers of the Union.

(*e*) The careful consideration of the restrictions that are from time to time placed upon the entry of fruit and produce into the several parts of the South African Union and the neighbouring States ; and the methods of examination of such fruits and produce at the various borders and elsewhere, with a view to opposing all restrictions that are unnecessary, harsh, or enforced in an arbitrary manner.

(*f*) To act as agents for members on the co-operative purchase of boxes, wood-wool, wrapping paper, artificial manures, feeding stuffs, spraying material, machinery and implements, and all or any supplies used in connection with the growing and marketing of fruit for any members who may wish to avail themselves of the Association's services in this respect.

(*g*) To watch the importation of fruits, trees, plants, etc., which might affect the industry either by the introduction of insect pests or otherwise.

(*h*) The collection and dissemination among members of the latest information relating to the combating of pests affecting the industry. The dissemination of information regarding the varieties of fruit best suited to the requirements of the different markets, and the most approved methods of packing for such markets.

It must be recognized, the prospectus proceeds, that the success of the Union as outlined above will depend greatly on the funds at its disposal, and it is the aim of the Union to accumulate such funds as will

give it a strong position and enable it to confidently embark on any action that the interests of the industry may render necessary or advisable.

It is anticipated that by the clubbing together of orders the Union will have such a mass of business to place that it will carry considerable weight with the different manufacturers and suppliers. The small grower especially will enjoy advantages that it would be impossible for him otherwise to obtain. The Union will look to the commission charged on such business as one of its main sources of revenue to enable it to pay management expenses and build up a reserve fund ; but with the advantages in buying which it will be able to secure, it will be possible to charge a commission and still secure substantial benefit to members.

It will be the aim of the Union to make its headquarters in Capetown as attractive as possible, and as useful ; and it is hoped that the funds will allow of the purchase of journals and literature relating to fruit growing and other matters of interest to farmers, which should always be available for members of the Union. Further, it should be possible to set apart a room for the use of members when visiting Capetown, in which they can transact business or deal with correspondence.

It is also the aim of the Union to have at its headquarters an exhibition of the products of the members, manufactured or otherwise.

RULES.

The following are the principal rules for the general working of the Union :—

1. The membership of the Union is confined to bona fide fruit growers. Any person wishing to join shall be proposed by a member of the Union and be approved of by the General Committee.

2. Each member shall be bound to contribute to the funds of the Union on the basis of the number of fruit trees or vines (of table varieties of grapes) owned by such member. The minimum contribution to be one pound (£1), which shall cover 1000 fruit trees of 5000 vines. An additional payment of ten shillings (10s.) per annum to be made by each member for every additional 1000 fruit trees or 5000 vines or portion thereof owned by such member. In the case of White Hanepoot vines, however, the payment shall be made at the rate of 10s. per 10,000 vines (with a minimum of £1), and in the case of Hermitage vines at the rate of 10s. per 20,000 vines (also with a minimum of £1). The maximum payment from any member to be £25 per annum.

In computing the payment to be made by members, the following shall be exempt :—

Pears and Prune trees	Under	6	years old.
Apples and Apricot trees	,,	5	,,
Citrus trees	,,	4	,,
Peach, Nectarine, and Plum trees ...	,,	3	,,
Vines	,,	3	,,

3. The voting power to be according to the annual subscription or payment. Each member shall have one vote, with an additional vote for every £5, or portion of £5, after the first £5.

4. The management of the Union to be vested in a committee of fifteen members, who shall be elected at the first general meeting by the members of the Union. At any meeting of the committee six members shall form a quorum. The committee to have power to elect a president, vice-president, and executive, also sub-committees to deal with the various

branches of work in which the Union is interested. One-third of the members of the committee shall retire annually, but shall be eligible for re-election. The members to retire at the end of the first year to be decided by ballot, and the members remaining on the committee also to ballot as to which members shall retire at the end of the second year. After the first election, all members of the committee shall be elected for three years. The committee to have power to fill up any vacancy which may arise pending the next annual meeting. Members have the right to vote by proxy for members of the committee.

5. The annual general meeting shall be held in each year at a time and place to be arranged by the committee; each member shall receive eight clear days' notice of such meeting, when the committee shall submit a report and financial statement, and when the election of the members of the committee shall take place.

The secretary shall call a special general meeting at any time on receipt of a requisition signed by at least seven members. Eight days' notice of such meeting to be given.

The committee shall have the power to call a general meeting at any time on giving eight days' notice.

The committee shall meet at least once a quarter.

6. Any member of the Union failing to meet his obligations shall cease to be a member of the Union.

7. The committee to have power to establish an office in Capetown for the transaction of its business and to appoint a competent secretary or other official.

8. The Union to be entitled to charge a commission on all purchases made for members, the amount of such commission to be decided by the committee.

9. Any alteration of, or addition to, the rules only to be made at a general meeting of members, after fourteen days' notice having been given as to the nature of the proposed alterations.

Any fruit grower desirous of joining the Union should communicate with the Secretary, Frank H. Wood, 70 St. George's Street (P.O. Box 1200), Capetown.

The Principal Micro-Organisms Playing an Important Part in the Making and Maturing of Wine.

[Lecture delivered by Dr. A. I. PEROLD, Government Viticulturist (Cape), before the Paarl Farmers' Association on the 13th Decmber, 1910.]

ANY one who has more or less closely followed the development of wine-making during the last thirty years will at once realize the extreme importance of this subject.

We know now that the process whereby grape juice gets converted into a matured wine is a most complicated one, involving the continual action of scores of different micro-organisms, each playing a well-defined role, sometimes useful but also frequently otherwise.

I take it that the simplest way will be to discuss the various organisms in the chronological order in which they start their action. For this purpose we shall distinguish the following groups :—

1. Those on the Green Berries.
2. Those on the Ripe Berries.
3. Those in the Must.
4. Those in the Young Wine.
5. Those in the Bottled Wines.

We must always bear in mind that only such micro-organisms are to be discussed as play an important part in the making and matūring of wines, and that they are to be discussed only from that point of view. First, then,

THOSE ON THE GREEN BERRIES.

Here I think mainly of *Oidium Tuckeri,* which is caused by a fungus called *Uncinula spiralis.* The action of this fungus I have already discussed in my lecture on "Our principal Vine Diseases", held some months ago. The great point that interests us here is the *mouldy smell and taste* it imparts to the grapes. It further renders the proper ripening of such grapes impossible. If grapes that are badly suffering from oidium get mixed with sound grapes, the wine thus obtained will nearly always be inferior in quality. Hence all grapes that have been badly suffering from oidium and other fungoid diseases, such as anthracnose, *ought to be pressed separately.* Where possible the must ought to be separated at once from the stalks and husks by means of a press, and where this is not possible the must ought to be run off as soon as it will flow freely. Such wines ought not to be mixed with good wines, unless there should be no fault to find with them.

2.—THOSE ON RIPE GRAPES.

In addition to oidium and anthracnose there are many other micro-organisms that may develop on ripe berries. It is especially in damp

parts or during wet summers that we find these organisms growing on the ripe berries. The most important ones are the following :—

Plasmopara viticola, causing in this case the "Brown Rot";
Guignardia Bidwellii, causing in this case the "Black Rot";
Botrytis cineria, causing in this case the "Grey Rot";
Penicillium glaucum, or ordinary green mould;
Saccharomyces ellipsoideus, or wine levures; and
Acetic bacteria.

Of these the first two need not be considered here, as they do not occur in our wine districts. The next one, however, is most important. It is this fungus which, in too wet summers, causes grapes to rot so easily, and under normal climatic conditions either makes no appearance at all or, if it finds sufficient moisture, causes what the Germans call "Edelfäule", which means "noble rot". To the naked eye it appears to be a grey powder on the skin of the ripe berry. On looking through a microscope one sees a great many inflorescences on the berry. Each of these may be popularly described as a small tree, having only a stem, branches, and fruit, but no leaves. The fruit must be imagined to be grouped in thick clusters evenly distributed all over the tree. These small bodies that I have called the fruit, are the conidia or seeds, which spread the disease so rapidly during summer and autumn. On making thin sections through the skin of the berry one finds the roots of these trees right inside the berry, in its flesh or pulp. To be quite correct I must add that these trees have all one common root-system, so that the different trees are all intimately connected with each other. The roots are composed of thin tubes or threads that ramp about inside the berry, and are known as the mycelium. During dry weather the botrytis cannot grow well, but as soon as it finds sufficient moisture in the atmosphere surrounding the grapes, the conidia germinating (or budding) on the ripe berry will send their mycelium (or roots) right inside the berry. If the weather now remains fair, all that happens will be a gradual concentration of the juice inside the berry. From Mueller-Thurgau's classical researches on this subject we know that some of the sugar is consumed by the fungus, but at the same time this latter causes such an increased loss of water by evaporation that the berries soon get changed to a state bordering on that of a raisin. Along the Rhine and in Sauternes all the berries that have reached this state are picked separately. The must that is pressed out of them sometimes contains over 36 per cent. of sugar. Needless to say that these wines are perhaps the finest the world can produce, and that they are accordingly sold for prices running into hundreds of pounds sterling per leaguer of wine.

If the air gets too much charged with moisture, as would be the case with continued summer rains, then our former ally in the making of an excellent wine becomes our worst enemy. The fungus then develops so rapidly that whole bunches rot away, the berries dropping readily on shaking the bunch.

The best one could do in such cases is to remove the leaves from the inner part of the vines and the lower part of the shoots, leaving only some three or four leaves above the last bunch of grapes. In that way the sun gets a chance to dry up the conidia and so prevent the disease from spreading further, whilst at the same time checking the further rotting of those berries already infected. There is no great danger of

the grapes getting sunburnt, since at this state of maturity burning is practically out of the question. In any case the removal of the greater part of the leaves will always do more good than harm in all cases where grapes suffer from "grey rot". Wines made from such grapes will at first always tend to get turbid. The Botrytis leaves in the must a certain substance (called an enzyme) which causes the turbidity. This is what the French call "casse", which means "breaking", and conveys the same meaning as the Dutch word "skif" that is applied to the coagulation of slightly sour milk on boiling.

In order to avoid this "casse" it is necessary to sulphur the must of such grapes heavily, the clear liquid can afterwards be drawn off, aerated, and then be inoculated with pure levures or some sound, ripe, freshly-crushed grapes. The young wine should in such cases at first be heavily sulphured in order to destroy the enzyme that causes the casse.

Green mould or *Penicillium glaucum* would of course give the grape must, and wine, a mouldy smell and taste, and therefore all grapes suffering from it should be carefully separated from the sound grapes. This is a most important matter, as otherwise good wines could easily be spoilt. This mould as a rule seldom assumes any alarming proportion.

The wine-levures do not grow much so long as the berries remain intact. As soon as these are, however, disintegrated by *Botrytis cineria*, the levures start budding and cause a preliminary fermentation in the berries. The greatest danger here is the development of the acetic bacteria. These change the alcohol into acetic acid, so that in wet summers, when the ripe grapes start rotting you will soon find the whole vineyard spreading a smell of vinegar. Such grapes ought to be kept far from all sound grapes. Further, they ought to be pressed out immediately after being picked, the must once separated from the stalks and husks should be strongly sulphured, the clear liquid drawn off, then aerated and fermented dry with pure levures, preferably such as are accustomed to large quantities of sulphur-dioxide.

3.—THOSE IN THE MUST.

It is evident that all those micro-organisms that we found occurring on the ripe berries will also be introduced into the must. Whether they will all develop here is another question. If the must is cold and all the fermenting tanks or "kuips" are being used for the first time in the season, then the fermentation will be slow to start. The consequence is that *Botrytis cineria*, acetic bacteria, and other organisms begin to grow on the must, especially when mixed with the husks and stalks. After some days the fermentation proper will then start and suppress all the other micro-organisms. But in most cases the harm will already have been done, inasmuch as the acetic bacteria will henceforth remain in the wine and *always be a source of danger* to its keeping. If the wine is not fermented quite dry—without any fortification—and especially if, further, the casks are not kept brimful or are not sulphured at least once a month and kept tightly closed and as cool as possible, one usually finds such wines turning sour in the summer months. But of this more later on. Here I wish to discuss principally the wine-levures and the mannitic bacteria since they are the most important micro-organisms deserving our attention at this state of the process of wine-making.

WINE-LEVURES.

These alone merit a whole lecture being devoted to them. At some future date I hope to give you more details and some photos of these levures so that you may be able to form a clear conception of them. For the present I must limit myself to speech. To begin with there are a great many different varieties of levures. Here only those called wine-levures interest us. Of these we can at once distinguish two big groups :—

1. The somewhat pointed ones, called *Saccharomyces apiculatus.*
2. The oval ones or *Saccharomyces ellipsoideus.*

The former usually start the spontaneous fermentation of the must. In the fermentation of the juice of apples and pears (thus in the making of cider) the Apiculatus-levures play a much more important part than in the present case. Here the alcohol formed soon checks their further development. They are then suppressed by the elliptic levures. These are mainly responsible for the alcoholic fermentation of grape juice. If pure levures (see later) are used from the start off the Apiculatus-levures play only an unimportant part in the fermentation. They can easily be distinguished from the elliptic levures with the aid of a microscope. They are not only much smaller than the elliptic levures, but also differ from these in shape, as they are distinctly pointed (hence the name "apiculatus"), whereas the elliptic levures are oval, say egg-shaped. These may either be a regular long oval as a duck's egg, or thicker at the one end, thus resembling more a hen's egg.

The mere size or form is not sufficient to tell which levures are alike and which belong to different varieties. It may be interesting to give you some idea of the size of these levures. Although they vary considerably in size one may express their mean size as follows. Supposing you draw a line one inch in length and you could by some imaginary means handle these small cells (each individual levure consists of one cell or egg) individually and place them lengthwise on this line so that the ends will touch each other, then you will require no less than some 4000 of these cells to cover the whole distance. If you had placed them so that the sides touch each other, you would have required about 6000 cells. Whilst speaking of sizes I wish to point out that if instead of these levures we had been considering acetic bacteria, we should have required respectively 20,000 and 50,000 bacteria, which means that the length of these bacteria is about 1-20,000th of an inch, and their breadth about 1-50,000th of an inch. If you place one levure-cell on a smooth surface, then you can put about 45 acetic bacteria on the surface that had been occupied by the one levure-cell. I hope you will now all readily admit that no one in looking through a microscope can ever confuse levures with acetic bacteria.

Now a few words about *the mode of growth* of these levures. I am sure that you have all already seen how a potato sometimes starts budding whilst lying on the loft, forming small potatoes at its surface. Well, now, in the same way the levure-cell buds. Usually it buds at any place, although certain levures bud preferably at the ends. These buds soon grow to the size of the mother cell, and they again start budding on their part. One cell can form several buds at the same time. The new cells either remain closely attached to the mother cells or get separated from these by the least disturbance. Hence in fermenting must you will

mostly find single cells or mother cells with young buds. Here the escaping gas (carbon-dioxide) separates the full-grown buds from the mother cells.

If the grapes are sound the levures that are on the berries and thus get introduced into the must take some time to start budding. So it takes some time for the levures to grow to such numbers as to cause a visible and notable fermentation. Once this stage is reached the levures still go on multiplying for some time. Then as the air nearly all gets displaced by carbon-dioxide their growth diminishes very much. It is in this half-asphyxiated state that they are most active as ferments. The cells then abundantly form a certain substance which directly causes the must to ferment. This substance is one of the so-called "enzymes", and has been variously called "zymase" or "alkoholase". It has for the first time been prepared by Prof. Ed. Buchner in 1897. By finely grinding levures with a peculiar fine sand (infusorial earth) and then filtering the mass through an earthenware filter, he succeeded in getting a liquid which contained absolutely no cells of levures and still had the property of causing sterilized must to ferment. Needless to say the so fermented must afterwards contained no trace of any cells of levures. Interesting as this is in explaining the process of fermentation we are nevertheless still dependent on the proper growth of our elliptic levures for a successful fermentation. It is therefore of the utmost importance to favour their development to the exclusion of all other kinds of micro-organisms. There are three qualities which they possess of which we can make use in this case. They are :—

1. The most favourable temperature for their growth and fermentative action, lying between 25°-30° Celsius, or 77°-86° F.
2. Their high resisting power against the fruit acids in the must.
3. They can be acclimatized to high doses of sulphur-dioxide.

In order to conduct the fermentation as near as possible to the most favourable temperature we must

(1) pick our grapes as cool as possible ;
(2) mix the coolest grapes with the hottest grapes ;
(3) mix the lower layers of the fermenting must with the upper layers, since the latter are always warmer than the former ;
(4) cool the fermenting must by means of a cooling machine or by putting copper tubes inside the fermenting liquid and running cold water through these tubes.

(5) If *after having exhausted* the above means of combat the temperature still goes up to 35° C. or 95° F., then add four ounces of potassium metabisulphite to every leaguer of must. This will partially check the fermentation and cause the temperature to fall. It must be remembered that the fermentation of the must causes a great amount of heat to be liberated, hence the above possibility.

In order to suppress as far as possible the injurious micro-organisms during the fermentation, one could arrange to have from 6-8 per mille total acid (as tartaric acid) in your must from the start off. Supposing your must contains only 4.5-5 per mille total acid—as will frequently be the case with green grape—all you need do is to add 20 oz. or 1¼ lb. of tartaric acid to every leaguer of must for every per mille you wish to raise the total acidity. So that generally speaking one can safely say that an

addition of 1-1½ lb. of tartaric acid to every leaguer of must from well-ripe green grapes will certainly help a great deal to improve the quality of the resulting wine and increase its keeping qualities.

More effective than an addition of tartaric acid is the use of *pure levures,* and especially so when these have been *acclimatized to high doses of sulphur-dioxide.* These can then grow and set up a regular fermentation in the presence of such quantities of sulphur-dioxide as will practically exclude the growth of all other micro-organisms. At this stage I wish to say a few words about the subject of

PURE LEVURES.

In order to deserve their name and be recommendable in wine-making, these levures ought to fulfil the following conditions :—

1. They must contain *no bacteria* or other micro-organisms barring levures.
2. The levure cells must all be descendants of *one single cell.*
3. They must give a clean, regular, and fairly rapid fermentation and firm deposit, so that the wine gets clear soon.
4. They must be able to ferment wines dry to about 15 vol. per cent. of alcohol.

This year some party imported pure levures from the "Institut La Claire", at Le Locle, in the Swiss Jura. On examining them microscopically I found them to contain *very large quantities of bacteria.* No one else than the famous Professor Mueller-Thurgau, of Waedenswil (Switzerland), has likewise found the pure levures of this Institute infected with bacteria.

This is quite sufficient to *absolutely condemn* these pure levures. For although these bacteria may sometimes be harmless, they can just as easily be most harmful. I was only recently told of two whole cellars of wine in this district that got sour on account of these very levures having been used during the fermentation. The danger is that you may inoculate your whole vintage with acetic bacteria unless you know the pure levures really to be pure. At our recently-founded local Oenological Station I have already cultivated some ten different varieties of absolutely pure levures. They are still being studied. Some of them promise to give good results. During this vintage I shall carry out experiments with them, and shall be prepared to distribute some for private experiments. I hope to have several good and tested varieties of pure levures ready for the 1912 vintage.

MODE OF EMPLOY OF PURE LEVURES.

Pick some four baskets of your soundest, well-ripe grapes two to three days before you start pressing. Crush these grapes, squeeze out the must and heat it up to a temperature of 50° C. or about 120° F. Pour it into a clean half-aum or other small cask, *whilst still hot.* As soon as the temperature has gone down to about 30° C. or 86° F., open the bottle containing the pure levures and pour its contents into the must. Now put a clean sand-bag on the bunghole and leave it standing till required. The must will almost immediately start fermenting. When required, shake the cask to mix the deposit thoroughly with the supernatant liquid. In a clean vessel pour about one gallon to every five leaguers of must. If the must is not too cold fermentation will soon start and go on steadily till either all the sugar has been fermented out or the wine contains some 15 vol. per cent. of alcohol.

If you now ask me what are

THE ADVANTAGES OF THE USE OF PURE LEVURES,

then I can briefly reply as follows :—

1. In wet summers, when the grapes arrive at the cellar in an unsound state, pure levures when added to the vintage in sufficient quantities will ensure a fairly pure fermentation, and consequently give the best wine you could get in these circumstances. In this case it is advisable at once to separate the must from the husks and stalks. In case of red grapes from which a red wine is to be made, half a pound of potassic metabisulphite could be added to every leaguer of must. This must be done immediately the grapes are crushed. The fermentation will usually not start for some days. If the husks are continually being pressed under, the colour will soon be dissolved. As soon as the must is sufficiently coloured it may be drawn off and then fermented with pure levures acclimatized to sulphur-dioxide in such high quantities. Here it must be remembered that the sulphur-dioxide partly decolourizes the must for the time being, so that the finished wine will be much darker in colour than the must when it was drawn off.

2. Perhaps the greatest advantage of pure levures is that *you are sure to get a good, regular, clean fermentation*, with no sugar left unfermented in the young wine, unless your must happens to have had over 25 per cent. of sugar, which is very rarely the case.

3. In a hot climate like ours very many wines turn sour if kept right through the hot summer months. The reason usually is the following. Through carelessness or unfavourable circumstances the wine was not fermented dry before winter. The little sugar thus left in the wine greatly favours the development of acetic bacteria during the hot summer months. It must never be forgotten that practically *every young wine contains some acetic bacteria*. If the wine is fermented dry before winter, if the casks are further kept full and well closed, and if the wine is racked over into a clean, well sulphured cask towards the beginning of spring (say the 1st of August), then such a wine will remain good in future so long as it is rationally treated.

But if a wine is not fermented dry before the beginning of winter and the other precautions are not strictly observed, then such a wine is bound in nine cases out of ten to turn sour. If you ask me why your wine would not ferment till it was dry, I could only reply that you conducted your fermentation badly. Well, if this has come to pass, then the best thing to do is to inoculate the wine with a good dosis of pure levures before it gets too cold. These will then ferment out the remaining sugar unless the original must contained over 25 per cent. of sugar. The wine will then soon get clear, and the danger of it turning sour is reduced to a minimum.

If you wish to avoid the use of pure levures and yet ferment out all the sugar in your must, then keep the temperature down, and always control your fermenting must. As soon as you notice that the fermentation is getting very slack, whilst your young wine still contains some sugar, rack it over into a sound cask that is only very lightly sulphured. Let the must first drop through the air into an open tub, and then pump it into the other vat. It must during this racking over get as much air as possible so as to revive the levures to greater activity. Should this prove unsuccessful then make use of pure levures.

MANNITIC BACTERIA.

If the temperature of the fermenting must goes up to and beyond 40° C. or 104° F., then levures suffer greatly and the fermentation gets bad should this state of affairs continue for a day or more. In these circumstances the mannitic bacteria develop rapidly and partially suppress the alcoholic fermentation. They form no alcohol but change the sugar into mannite (a sweet substance) and other products, amongst which are certain volatile acids. This is par excellence a disease of wines in hot climates. Since I started my work locally I have already met with one case of this disease. The worst is that it is so difficult to cure. The best is either to pasteurize such a wine or, where that cannot be done, to fortify it with good spirits of wine to about 16.5 vol. per cent. of alcohol. If the quality of the wine is not high enough to warrant its fortification it ought to be distilled without further delay. Wines suffering from the mannitic disease are sweetish-sour, and had best to be treated as suggested above.

THE MICRO-ORGANISMS IN THE YOUNG WINES.

The principal ones are :—

1. Acetic bacteria.
2. Flowers of wine or *Mycoderma vini.*
3. Mannitic bacteria.
4. Bacteria decomposing malic acid into lactic acid, thereby diminishing the total acidity of the wine.
5. Bacteria decomposing cream of tartar, and many others.

The first are the most common. They gradually change wine into vinegar. There are a great many different varieties of acetic bacteria. Whilst in Switzerland I carried out researches on the acetic bacteria in wines. These researches I am now continuing with our own wines, and I hope to be able to give you my results in the near future. It is of great importance that we should know our own acetic bacteria, because such knowledge will be useful in the fortification of our wines, as well as in our vinegar industry. I believe that we have to do with acetic bacteria that can stand greater quantities of alcohol than those generally occurring in most European wines. The development of these bacteria can easily be suppressed by a prompt and regular fermentation at a temperature somewhere near 86° F. or 30° C., whereby the wine is fermented dry. If the wine is further stored cool, the casks are kept clean, full, and well closed, and *well sulphured* when racked over. If a cask cannot be kept quite full it ought to be sulphured regularly every fortnight during the summer, and otherwise every month and kept well closed.

The flowers of wine play a most important part in the making and maturing of sherry, as I have perfectly convinced myself at Jerez de la Frontera, in Spain. At a future date I hope to go more fully into both the questions of acetic bacteria and flowers of wine.

The mannite bacteria have already been discussed.

The remaining two I am not sure to have met with here already. So they need not to be discussed for the present.

MICRO-ORGANISMS IN FRESHLY BOTTLED WINES.

Sometimes these wines turn turbid and give a whitish deposit. I am at present studying two such wines. In one case the wine has

16.5 vol. per cent. of alcohol, and still it gives big white flocks consisting of bacteria. It is a wine of a sherry type. The other is a delicious light white wine with a fairly high total acidity. It may possibly be a case of the fourth group of bacteria mentioned above.

Certain red wines give a brown deposit and acquire a bitter taste as a result of the action of a certain bacterium.

But enough, I just wanted to give you a rapid survey of the principal micro-organisms that we have to reckon with in the process of making and maturing our wines.

CONCLUSION.

In conclusion allow me to tell you that nearly all our wine merchants complain that the bulk of our ordinary wines of to-day are far from satisfactory. They say we used to make better wines before our vineyards had been destroyed by the phylloxera than we are making to-day. Such a general complaint cannot be without some foundation. What then is the reason ? Is it because we have now reconstituted our vineyards on American stocks ? Yes and no. In certain cases the vineyards now produce more heavily and the vines are more vigorous than they used to be before the phylloxera came. This frequently gives rather light wines, which is ever so much more difficult to handle than a strong wine. But these difficulties can be overcome by proper systems of pruning and manuring. Further we must bear in mind that many vineyards are still fairly young and that young vines never can give the same quality of wine as older vines.

In many cases the American stocks do not suit the circumstances, and consequently the grapes ripen badly and cannot be expected to give good wine.

I do not know of a single instance where the right American stock has been grafted on where the wine is not now at least just as good as it used to be formerly under similar circumstances. But the fact of the matter is that the bulk of our wine farmers of to-day know less about wine-making than their forefathers used to know. And worst of all, our farmers are frequently *far too careless* in making their wines. *Wine-making is an art and not a thing to be trifled with.*

Keep your cellars and casks *scrupulously clean*. Sulphur your casks and wines *regularly*. *Pick your sound grapes first* and keep any bad and diseased grapes away from the rest. Do not start pressing before your grapes are well ripe, and do not pick your grapes during the hot hours of the day. *Never put any water into your must* so as to increase the quantity of wine, for it is not only forbidden by law but will make you lose more in quality than you can gain in quantity. Such wine will easily turn sour. If your grapes are too sweet to ferment dry, turn your must into sweet wine by adding spirits of wine or otherwise. *See that your wine ferments dry before winter*. Keep your vats filled and well closed. Keep your cellars absolutely shut during hot days, only open them now and then during a cool night. Many wine farmers I know sin in this respect. Rack your wines over towards the end of winter, say, during the first half of August. Do not forget to sulphur your casks and wines regularly. Keep my lectures and read them carefully at least once a year. Try to carry out the suggestions made therein. Communicate to me your difficulties and I will help you as far as possible to overcome them. Let us all make a united and determined effort *to make only good wines,* and we shall have overcome the greater part of our difficulties.

A Co-operative Winery in the Cape Province.

By OTTO E. MENZEL.

THOSE who have visited the seaside resorts of False Bay will remember the gigantic chain of mountains that stretches along the eastern side of the bay, locally known as the Hottentots Hollands. This name is said to have historical origin. In the 17th century, when the first Hollanders reached the shores of South Africa, they advanced from Capetown towards the east, in the direction of Stellenbosch, and seeing before them a large, level plain they exclaimed, "Dat is Hottentots Holland" (that is the Holland of the Hottentots), and ever since then the mountains bordering on that plain have been known as the Hottentots Hollands Mountains.

On the left of this chain, which stretches far into the country, one mountain, the Helderberg, standing high and clear against the skies, gives its name to the neighbourhood, the Helderberg Ward, in the District of Stellenbosch, and at its foot is situated the beautiful farm Helderberg, belonging to Mr. J. W. Hofmeyer. The homestead, a fine dwelling typical of the Cape, surrounded by magnificent oaks sixty to seventy years old, presents a picturesque sight to the visitor. To the right and left the eye is attracted by orchards and flower gardens containing carnations, sunflowers, lilies, and geraniums, whose bright colours enliven the dark shadows of the pines and acacias in the rear. In front stretches a large track of softly undulating country covered with vineyards, whose bright green is broken here and there by the darker tints of pine woods and blue-gum plantations and ending in the white and blue horizon of the seashore and the sea. And to this beautiful picture the glorious Table Mountain forms a fitting background.

At about a mile's distance from the farm a group of large buildings stand out amongst the vineyards. This is the Helderberg Co-operative Winery, the largest winery in the Cape Province. The buildings consist of four sections, viz., one fermenting-house and three wine cellars, the latter, seen from the inside, forming only one large cellar. In front of the fermenting-house, which has four large windows (or rather doors), an embankment has been thrown up against the wall forming a platform. On this platform the grapes are off-loaded from the wagons in small trolleys running on rails—very similar to the trolleys used on the mines of the Transvaal for transporting tailings. These trolleys, after running over a scale where they are weighed, are emptied through the windows into the crushers, which are placed just underneath the windows inside the fermenting-house. During the period of vintage these crushers are constantly working, being set into motion by means of a 16-h.p. engine situated in an adjoining room.

The juice from the crushers is run through chutes down to the fermenting tanks. There are twenty-four of these large tanks built of concrete, having a capacity of 28 leaguers each, and twenty-four small ones with a capacity of 14 leaguers each—a leaguer being equal to 127 gallons. Each tank is provided with patent taps by means of which the must is run into cement channels, which in turn convey it into the vats in the wine cellars. These gutters being made of cement can easily be thoroughly cleaned.

The juice having been extracted, the husks are brought by means of trolleys to the distillery, where they are refermented with water, some being made into piquette—a weak wine which the labourers consume—the balance being used for distilling purposes. After having undergone this treatment the husks, or what remains of them, are distributed amongst the shareholders, who use them for feeding pigs and fowls. The fermenting-house measures 142 ft. × 74 ft., and its roof (framed of Oregon pine) has a span of 61 ft. 6 in.

From the fermenting-house one descends into the cellar. This contains forty-eight large cement vats, each having a capacity of 28 leaguers, and fifty-three large wooden vats of an average capacity of 7 leaguers each. The cement vats are made of bricks in 1½ to 1 cement, plastered with cement, and coated with wax. The wooden vats are placed on steel rails.

The *must* from the tanks in the fermenting-house, when the fermentation is complete, runs into the above-mentioned vats, where final manipulations take place which result in the matured wine. A rubber-pipe attached to the portholes runs the wine to barrels when it is ready for sale. The barrels are then rolled out through a huge door at the end of the cellar, and after being loaded on to wagons are ready for shipment. The floor is of concrete, and along the walls of the cellars water-pipes run—in order to control temperatures, a most essential feature—so that everything can be kept scrupulously clean and cool. The water is obtained by means of a 2-in. pipe from a reservoir situated about half a mile distant from the winery. The cellar measures 154 ft. × 106 ft., and the roof consists of three spans of 51 ft. 4 in., supported on 10 × 5 steel stanchions and girders.

To give readers an idea of the large dimensions of this cellar, I may state that—if it is completely fitted with vats—3000 leaguers (or 381,000 gallons) can be stored therein.

The distillery is situated next to the cellars in which the wine which is not considered of sufficiently high grade for the market is distilled into brandy. This building measures 123 ft. × 34 ft., part of it being arranged for the making of piquette. There are eighteen tanks of 15 leaguers capacity each, similarly constructed to those in the fermenting-house.

The engine-house from where the crushers are driven measures 23 × 14 feet.

A few yards away from the distillery are several large boilers of 15 leaguers capacity each, in which unfermented must is boiled into syrup. Formerly sugar was added to certain grades of wine, more particularly those intended to blend as heavy wines, but since the Adulteration Act was passed in the Cape only grape syrup—that is syrup made directly from grapes—may be used; and it is estimated that since the passing of this Act some 8000 tons of grape syrup have been used instead of sugar. Of course a large proportion of the wines

are marketed in a dry or light state, these including the Hocks or Drakenstein types and the Hermitages or Claret types. Therefore the Helderberg Co-operative Winery often sells must to the wine firms, who take delivery of it at the winery and there erect boilers at their own expense in order to produce the grape syrup. This syrup is then stored in the cellars of the winery at the expense of these firms if they so desire.

The whole cost of this winery amounted to £14,300, and this year another £700 will be spent. For the buildings and vaults about £11,000 were used, while the expenses for machinery, fustage (wooden vats, etc.), shafting, etc., amounted to about £4000. As the building materials (such as bricks, wood, etc.) were supplied by the members of the Co-operative Society, the erection of the winery was not so expensive as would otherwise have been the case. The Government has assisted by advancing part of the capital, on which the society pays 4 per cent. interest per annum and 2 per cent. towards the sinking fund.

The Helderberg Co-operative Winery consists of twenty-one members, and its affairs are managed by a board of directors, of whom Mr. J. W. L. Hofmeyer is the chairman. The management of the winery proper is in the hands of Mr. D. J. de Villiers, who at the same time is secretary to the society. To these two gentlemen I take this opportunity of expressing my indebtedness for the courteous manner in which they assisted me during my visit.

The society acts on strictly co-operative principles. The members are paid out *pro rata* to the quantity of grapes of each kind supplied. Distribution or payment is made only when the wine is sold, and is subject to deduction of 25 per cent. from each member for expenses. If the expenses during the year are less than 25 per cent. (they are never higher), the surplus is distributed amongst the members *pro rata* to their supply of grapes.

The fuel used in the winery, which mostly consists of firewood from blue-gum, oaks, pines, and Port Jackson willows, is also supplied by the members, who are asked to submit tenders at prices not exceeding 10s. per ton of 2000 lb. for either green or dry wood.

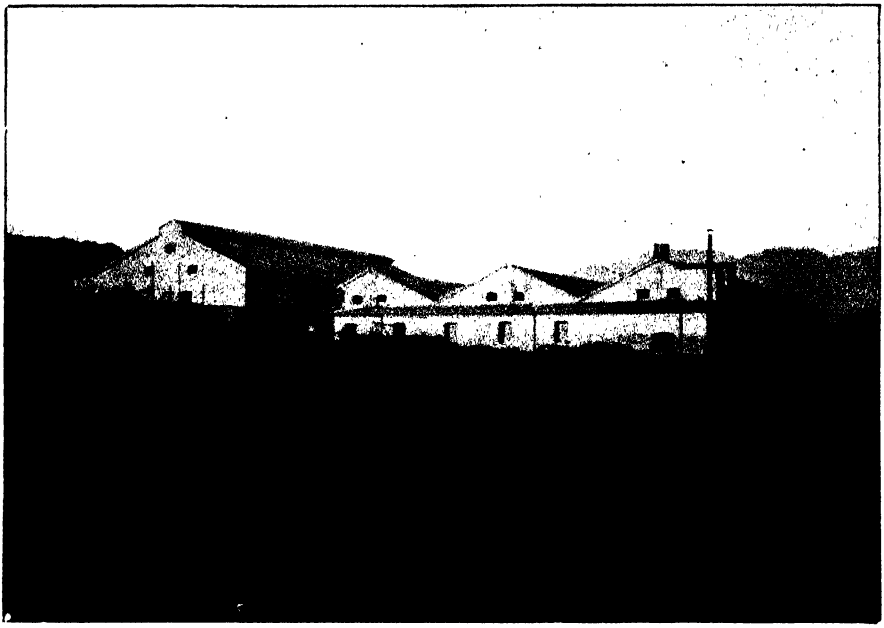
The transport of the wine to the nearest station is arranged by the members themselves. A list of names is drawn by lottery, and each member in his allotted turn has to supply cartage.

Since the establishment of this winery the vineyards in the district have increased considerably. The twenty-one members of the co-operation have at present about 1,250,000 grafted vines, all on phylloxera-resistant stocks, of which Mr. Hofmeyer is growing about 70,000 on his farm. In a fairly favourable year an acre planted with vines (5000 vines to an acre) gives a gross average return of about £40.

The annual average quantity of wine manufactured by this winery during the past few years was 1700 leaguers (215,900 gallons), but this year there will be at least 2000 leaguers (254,000 gallons) produced.

This again shows the great advantages which are derived from co-operation. It not only enabled these farmers to erect a large winery and buy the necessary machinery to manufacture their grapes into wine in a cheap manner, thereby increasing their profits—which would be much smaller if all the manufacturing had to be done by hand—but it also encouraged the growers to largely increase the area under vine cultivation.

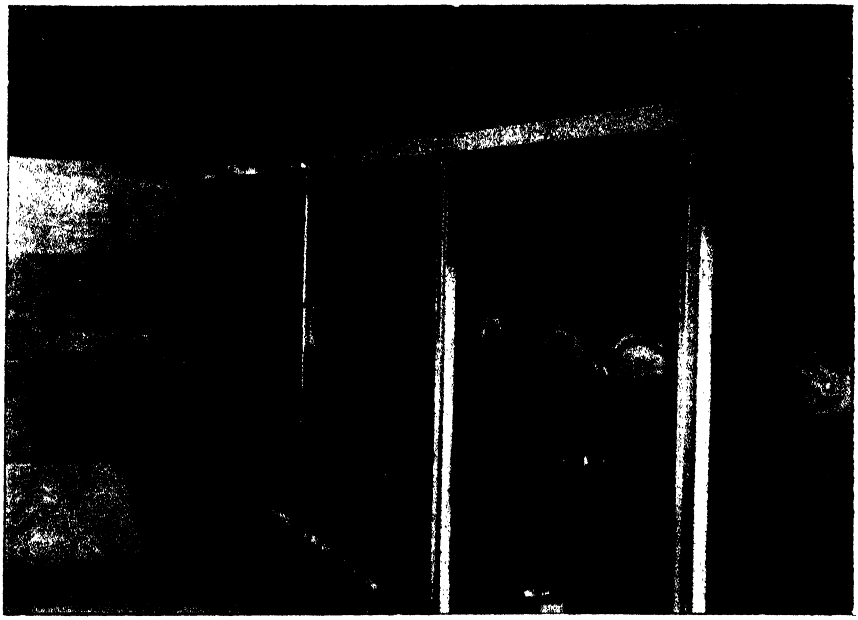
The Helderberg Co-operative Winery.



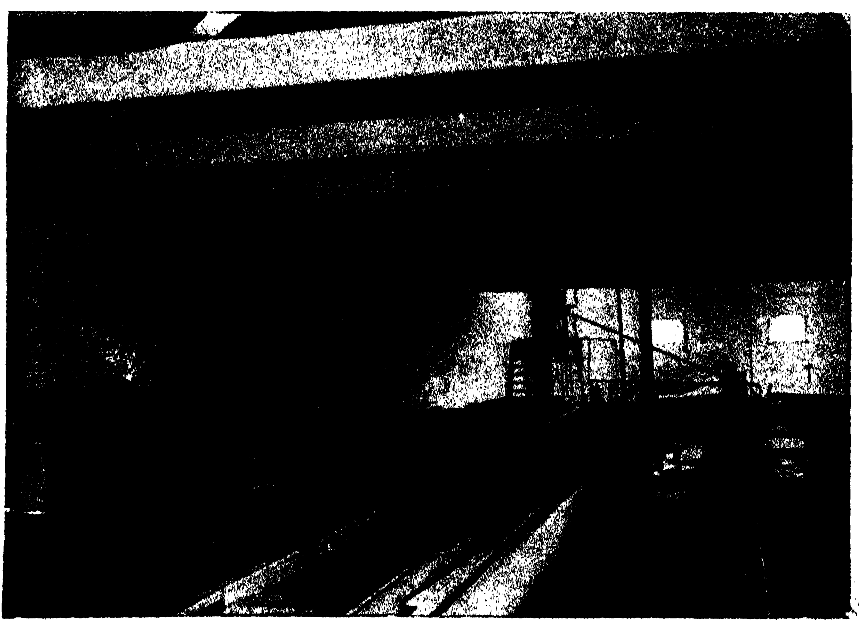
View of the Winery.

The Fermenting Cellar.

The Helderberg Co-operative Winery.



Part of Wine Cellar, showing Wine Vaults and Stukvats.



The Distillery.

The Working Over of Citrus Trees.

By C. A. SIMMONDS, Assistant Horticulturist (Transvaal).

THE early history of fruit-growing in this and other countries is practically the same with regard to the large number of seedlings grown. In those days any kind of fruit was good enough, and anything in the shape of fruit was readily saleable at good prices; as more fruit was grown consumers became more particular, and began to pick and choose, and, as a natural consequence, a few of the choicer varieties were more in demand than others. Growers of the commoner sorts seemed to think the days of profitable fruit-growing were over, hence the oft-repeated cry of over-production. We hear the same cry to-day, and I agree with those who complain on one point only, and that is this, "there is certainly an over-production of poor fruit".

This state of affairs is likely to continue unless more care is taken over the selection of suitable varieties for each district. On the other hand, with our great natural advantages which enable us to export citrus fruits at a season when competition is not keen, there is little likelihood of any over-production of good varieties, such as Washington Navel and a few others. Many of the trees raised from seed are good, but more are worthless; in fact, the percentage of good ones is very low in comparison to the number raised. Personally, I am one of the last persons who would like to see the raising of seedlings done away with altogether; I would still like to see a little of it done. I do not mean that one should raise seedlings in a haphazard way, but rather to carefully select seed from some particular tree, having some definite object in view to improve an existing variety.

This is the work of specialists rather than the men who are growing fruit for a livelihood, and the results would be a little more certain if deliberate crosses were made. The taking of a certain number of seeds and planting them with the idea of raising trees for commercial fruit-growing is nothing more or less than gambling. Further, it shows a very poor business policy. What would you think of a merchant who bought all his goods blindfolded, and trusted to them 'eing good?

Many of the old seedling trees bear really good fruit, which is worth keeping and propagating by budding. In almost every lot of seedlings one gets some that are better than others, but ...ntage of poor stuff is very high. Some time ago a man told ...he could not understand why the fruit from his second genera- ...edlings was ever so much poorer than from the original tree. ...ad a look around, and found it just as he had said. The fruit ... old original tree was really good, and that from the trees ...d been raised from seed of the good tree was very inferior. ...ger trees were of sufficient age to have good fruit on, had ...y been right. I also found that the parent tree had a few

bad companions, such as pompelmous and rough lemon; in consequence, the blossoms of the good tree became contaminated with pollen from the others, the result being the seed produced trees bearing worthless fruit.

By planting seedling trees you are taking everything on trust. You cannot possibly know whether all the trees are going to ripen their fruit at the one time, or whether the ripening period will extend over a length of time.

If all your fruit ripens at one time it means that you have simply to rush it off at any price. Whereas, if you plant budded trees you can regulate your output and secure the benefit of an earlier or later market. You can select your varieties and have early, late, and medium fruits.

A budded tree will give you some return in the fourth, fifth, and sixth years; that is more than a seedling will do.

BUDDING OVER NURSERY STOCK.

Raise your seeds in boxes or in the open, taking care to keep them moist. It is very necessary in this dry climate to keep a cover over the beds until the plants are through, even then they want shading a little. When the seedlings are big enough to handle, say from nine to twelve inches high, plant them out in nursery rows. Keep the rows about four feet apart, and give each twelve inches space in the row. This gives the trees plenty of room, and allows for cultivation and general working.

I have seen citrus nurseries that I would not care to go into, let alone work in them. It is not possible for a man to do good work if he is uncomfortable the whole time. Have your nursery ground well prepared before planting the seedlings out, and while the trees are growing keep the lower shoots rubbed off, so as to have a nice clean stem to bud on.

Start right in to bud as soon as the trees are a little thicker than a lead pencil, provided, of course, the bark on your trees lifts easily, and the bud is in a like condition.

Take great care in selecting your bud wood, and greater care in cutting and putting in the buds. Select buds without thorns; by so doing for a few generations it is possible to breed the thorns right out of a variety. Keep your buds wrapped up in a damp cloth, only taking out one stick at a time, leaving the others wrapped up unti the first stick is finished.

To bud, make a cut lengthways on your stock, and anot across; you can make the cross cut at the top or bottom, whichev seems best to you. Then cut your bud, holding the scion with t butt end away from you. Keep your knife flat; your knife m be very sharp; it is a good plan to carry a stick with a piece leather fastened on, and after cutting fifteen or twenty buds g your knife a rub or two on the leather, this will keep it in good orc Then insert the bud as quickly as you can; to do it well, tie the in and leave it so for a[illegible] days; it can then be unt if it is nice and green th[illegible] be headed down. When the starts to grow cut the head down to within four inches of the this leaves a stub to tie the young shoot to. After the bud has sufficiently strong to stand alone cut the stub clean away just the point of union, and give the cut a dab of thick paint.

When budding it is advisable to bud a few inches above the ground level; by doing so you keep the weakest part of a tree, and the part most susceptible to collar rot, above the danger zone. If your buds do not grow after the first budding, go through the whole process again and again until you are successful. Whatever you do don't graft nursery trees. A graft never quite makes the good union that a bud does. Every old grafted tree that I have examined shows a weak place at the point of union. Wherever it has been the practice to use this method of working over nursery stock the trees have been grafted low down, and in consequence a good number of the trees have been planted out with the point of union just at ground level, or just under the surface; this means that the weakest part of the tree has been put in the most likely place to contract disease.

STOCKS.

The only two stocks that can be taken into consideration at present are the rough lemon and the sweet orange.

Both of these have good points as well as bad, but the lemon seems to be the better as a stock for general purposes: it is more resistant to collar rot, and is a great forager; in fact, it collects too much plant food for a young top to absorb, which tends to make the first crop or two rather lemony. A tree on lemon is not affected by drought nearly as soon as one on orange: nevertheless, to a man who would plant his trees right, irrigate right, and cultivate right I would certainly recommend him to work his trees on to orange.

We are busy studying this question of stocks, and hope in a few years to produce a stock that will fulfil all requirements.

WORKING OVER OLD TREES.

As I have already said, there are a good many trees in South Africa that could with advantage be worked over to something better and more profitable. I should advise the following method of working these over:—

Start right in at the end of the dormant season and cut off all the branches fairly near the trunk, and as near the ground as you can, except where a number of branches start from ground level; in that case cut each branch off about twelve or eighteen inches above the ground. It is as well to leave a small branch fairly low down to keep up the circulation of sap. After the branches have been cut off cover the cuts with grafting wax to prevent decay, then give the stump and the short branches a good coating of whitewash to prevent sunburn. In a short time the tree will send out a lot of new shoots; suppress all those you don't want, and bud the others as soon as they are big enough. Each of these shoots can be treated exactly the same as a seedling in the nursery. Some may think it too big a sacrifice to cut the whole of a big tree down in one year; in that case do half one year and the other the next, or perhaps it would be better to experiment on a few trees, and then after getting the hang of the thing do the bulk. In closing I would like to say that this method of working over old trees has met with success in other parts of the world, and in the Cape Province I understand there are a good many gentlemen who have worked over old trees in this way, and are mightily pleased they did so.

Orange Export from Natal, 1910.

EXTRACTS FROM THE REPORT OF THE HONORARY SECRETARY TO THE MIDLAND FRUIT GROWERS' UNION (NATAL) UPON THE 1910 SEASON.

MR. CLAUDE FULLER, Government Entomologist, Natal, and formerly Chief of the Division of Horticulture in that Province, forwards the following brief report upon the 1910 season's export of oranges by the Midland Fruit Growers' Union, which has been submitted by the Hon. Secretary to that body (Mr. Albert Kelly):—

Reports upon the shipments have been regularly furnished by the Acting Trades Commissioner in London and by Mr. Poupart, to whom all our oranges have been consigned. Mr. Poupart's reports have been extremely favourable, and the Acting Trades Commissioner has frequently commented upon the excellent condition in which our fruit has arrived, the almost entire absence of wastage being in sharp contrast to shipments from elsewhere within the Union of South Africa. Only two cases of fruit were shown in the account sales as arriving in a wasty condition, and as these realized just half that given for sound boxes it is reasonable to suppose that even here the wastage was not very great. It is, of course, impossible to entirely eliminate decay in shipments on a commercial scale, and it was only in this one instance that the wastage was such as to affect the market value. Members can well be congratulated on the condition in which the fruit arrived on the London market, due no doubt to the care exercised in picking and packing.

The Acting Trades Commissioner has had occasion to refer to the rather low grade of our fruit as regards quality, more especially our Navel oranges, which were not up to the expected standard. The prices realized for our fruit, however, have not been below those obtaining for such whose quality has been more favourably reported upon, with the exception of some specially selected Washington Navels from Wellington in the Cape Province. This fact is no doubt in some measure due to their uniformly sound condition on arrival.

The chief fault found with our oranges is that on the whole they run small, whilst they are also lacking in colour and frequently show skin blemishes due to high winds. The question of colour is one that seems to depend largely upon soil conditions, and is a matter that requires some investigation, the desirability of which this Union might urge upon the Government.

The shipping season began with the 26th of May, and the last shipment went forward upon the 15th September. In the aggregate, the fruit sent by the Union amounted to 65¾ tons by measurement, the number of fruits being 191,894. The total amount disbursed to growers was £615. 5s. 5d. Throughout, the prices realized were very satisfactory, although fruit leaving here towards the end of June and along through July paid the best. The last shipment realized the poorest prices, this

being due to the poor quality and smallness of the fruit, coupled with want of juiciness and competition, but even in this instance the net return works out at 2s. 8¼d. per 100 on the tree, which cannot be considered an unprofitable figure.

The shorter prices realized for earlier shipments was to a great extent due to want of colour.

I have worked out separate accounts in respect of each shipper in every consignment, which include all the actual charges incurred between the farm and London, as well as a charge of 6d. each for the boxes and 3d. per 100 for the wrappers; an allowance of 6d. per 100 has also been made for picking, grading, and packing the fruit. They may, therefore, be taken as showing a very correct return of the net amounts realized by exporting oranges. Further, a very careful investigation has been made of the freight charges made against each consignment, and as these show that in the aggregate an overcharge of £22. 5s. 3d. has been made against shippers, the net return is really some 2¾d. per 100 fruits more than that which I shall indicate. In view of the fact that the overcharge as regards freight amounts to so much and on so small a quantity, it will be realized how very necessary it is for shippers to take every precaution against being mulcted in this direction.

The expenses of which cognizance has been taken in connection with these shipments are as follows:—

1. Picking, grading, wrapping, and packing (estimated at 6d. per 100 fruits).
2. Wrappers (estimated at 3d. per 100 fruits).
3. Boxes (half straps estimated at 6d. each).
4. Railage to Point (actual amounts paid by shippers).
5. Bill of lading, customs (actual allocation by agent).
6. Shipping charges (loading) at 2s. 6d. per ton (actual allocations).
7. Freight (actual allocations).
8. 10 per cent. primage on freight (actual allocations).
9. Cartage and market tolls (actual allocations).
10. London agent's commission (7½ per cent. on gross sales).
11. Local agent's commission (2½ per cent. on gross sales).
12. Cabled advice, telegrams, and exchange (actual allocations).

A careful consideration of all these charges incidental to our export shows that it costs 3s. 2d. to 3s. 6d. per 100 fruits to land oranges in London. Our fruit realized an average gross price of 8s. 6d. per 100, or, less the 10 per cent. involved in agent's commission, 7s. 8d. per 100; this, less incidental expenses, works out at 4s. 2d. to 4s. 6d. per 100 upon the tree, a figure that cannot be regarded with any but the greatest satisfaction, especially as all wastage that did occur is included in our calculations.

The disadvantages under which the Union has laboured this season are:—

1. The payment of 2½ per cent. on gross sales to the local representative of our London agents.
2. The overcharges in respect of freight allocations made by the shipping agents.
3. The impounding of the 10 per cent. primage collected by the Union-Castle Company on freight and shipping charges.

On the other hand, there have been several advantages. Chief of these has been the guaranteeing of freight by the London agent, which has lessened the cash laid out by shippers considerably. There have also

been certain minor savings by the allocation of charges foı bills of lading, customs entry, and cabled advices. No doubt also, there is a distinct advantage in having a local agent of the London seller to deal with.

In speaking with the Trades Commissioner, I may mention that he regards the 2½ per cent. commission paid locally as quite unnecessary, but I would point out that the only alternative to the present arangement is for the Union to have its own secretary, or for each individual to ship upon his own account.

* * * *

A further matter which members have to decide now is in relation to boxes for the coming season. I have to mention that the adoption of a standard package is imperative, and that a movement is afoot, supported by the Trades Commissioner and backed by the Shipping Companies, to have the standard orange package 12 by 12 by 26 inches over all. I am asked to urge members to accept this package, which limits them to a box of that measurement, or to a half-strap, two straps bundled together forming but half an inch deeper than the standard package. This is due to the extra top and bottom, but no exception would, I think, be taken to this slight and unavoidable departure from the dimensions laid down.

Reasons have been urged for having boxes of various depths, but I believe that if boxes are built to the specifications of the standard—which differ in being slightly larger and deeper than the half-strap used last season—most of the difficulties experienced in making up packs will be overcome. Another point is that by having all packages of a uniform size the individual shippers can keep track of their freight with ease.*

The next matter for consideration is the use of local or imported boxes. I have made considerable inquiries in this direction, and can say that there is no difficulty in securing local boxes at prices which are as advantageous as those of the imported article, and which are, for our present purpose at any rate, quite as good.

Local boxes can be secured of wattle-wood with deal ends, and admirable boxes of brushwood are turned out in Natal.

A box 26 by 12 by 5½ inches over all, tops, bottoms, and sides of wattle, and ends and centres of deal, may be obtained, put up in shooks, at 4d. each, whilst locally produced yellow and brushwood boxes, built to the same specifications, are turned out at a similar figure.

* * * *

There is one feature of a locally produced box to which I consider it my duty to draw attention, and it is that the ends will lack in finish, making paper labels desirable, and at the same time eliminating the possibility of obtaining printed ends.

The practicability of importing ends and centres is a matter that should receive attention, as printed ends could then be obtained, and it might be possible to reduce expenses by importing these and using wattle or brushwood slats for the tops, bottoms, and sides.

* It was subsequently decided that small boxes of two depths be utilized for next season's shipments, the advantages urging such an adoption being a saving of freight charges, and the facility with which the packs can be arranged. Further, our experience over three seasons' shipments has conclusively proved that our fruit will carry very much better in the half box than when sent in the standard package, whilst the account sales invariably add further testimony to the advantages of the smaller box.

Messrs. Pantin & Co. were communicated with, therefore, with a view to ascertaining at what price ends and centres could be imported, and in reply quoted 50s. per 1000 boards measuring 11½ by 5½ by ⅝ inches. Printing could be executed at 3s. per 1000 impressions, and it is thus seen that we could secure printed ends and centres sufficient to make 1000 boxes for £7. 16s. c.i.f. Durban, or just under 2d. per box.

* * * *

Regarding Continental sales, the Trades Commissioner holds the opinion that this is much better left to the discretion of the Home agents, and he discourages direct shipments to the Continent for the present. He is of the opinion that Messrs. Perkin & Adamson would be the best parties to send experimental shipments to Hamburg and such other markets as they might suggest, and that the matter of distribution should be left entirely in their hands, their knowledge of the tone of both the English and Continental markets enabling them to place the fruit to the best advantage.

Notes on the Fertilizers, Farm Foods, Seeds, and Pest Remedies Act (Cape Province).

By DR. C. F. JURITZ, M.A., F.I.C., Acting Chief of the Division of Chemistry.

UNDER the provisions of this Act, which was passed by the Cape Legislature in 1907, wide powers are conferred on the Government to frame regulations, having all the force of law, for the purpose of efficiently carrying out the Act. The first series of regulations under the Act was promulgated in September, 1908, and, as experience suggested, the regulations were improved and enlarged from time to time. The need for further extension of their scope was felt some months ago, and the entire set has therefore been lately revised, added to, and classified, and formal promulgation thereof was made in the *Union Gazette* of Tuesday, 20th December, 1910.

The endeavour in these regulations, as in those which they replace, has been to make as clear as possible all procedure necessary for compliance with the law, but it has ever been apparent that both merchants and farmers need fuller explanations of the several points dealt with, and of the reasons which give rise to them, than the regulations themselves can be expected to afford. There can surely be no need to labour any explanation that the object of the regulations is not to set merchant against farmer and farmer against merchant, but simply to provide the fairest treatment for both classes. These explanatory notes are written with a view to guide merchants and dealers in regard to the steps that have to be taken by them, for instance in registering the fertilizers which they intend to sell, so that they may be able to describe such fertilizers in accordance with the requirements of the law, clearly and correctly. They are also designed to aid farmers in understanding the meaning of the merchants' terms, descriptions, and figures, and to give them an adequate comprehension of the exact nature of any article that they may purchase.

HISTORICAL.

Before dealing with the regulations recently promulgated, a brief reference to the Act itself may be permitted. For its first forgleams we have to look back just over twenty years. In my annual report for 1892 I suggested that the time had arrived for commencing a regular investigation of such chemical manures as were being offered for sale in the Colony, and a preliminary trial was made during the succeeding year, when, in default of any statutory facilities for dealing with the subject, recourse was had to a commission agent for the purchase, in 100 lb. lots, of several fertilizers on the local market. These were analysed, and the results obtained were published, together with the names of the vendors. The figures in some cases were such as to lead to the comment in my next annual report that

> Fertilizers are frequently sold under names which are utterly misleading, and very often articles, valuable perhaps in themselves, are rendered useless by being applied to soils which stand in need of perfectly different treatment. . . . Chemical fertilizers are excellent, when used with the discrimination advised above, but as soon as such fertilizers are sold for certain stated purposes, such as for vines or potatoes, and the composition of the fertilizer is not given (guaranteed) by the seller, an element of danger is introduced.

Potatoes, for example, need much potash, but amongst that first lot of fertilizers investigated in the Government Laboratory at Capetown, was a "potato manure" in which potash was the very lowest

of all the constituents*—and yet that was a fertilizer valuable in itself, but it was quite unsuited to the needs of the potato. A "vine manure" showed similar anomalies, and a "Basic phosphate" contained less than 1½ per cent. of citrate-soluble phosphoric oxide.

But such a "wholesale" method of purchasing fertilizers for analysis was distinctly too expensive to allow of more than a few samples being taken, and, as a matter of fact, during that first year only eight such samples were procured. The embryonic condition of the laboratory at the time caused the lapse of two years ere any further active steps could be taken, but in 1894 a suggestion was made by me to the Under-Secretary for Agriculture for the introduction of a Bill to control the sale of fertilizers, and in 1895 I recommended that, failing such a Bill, samples of the various fertilizers on sale should be analysed periodically, and the results of the analyses published, so as to enable farmers to know the composition of the materials purchased by them, and their suitability to the needs of soil and crop. The latter plan was at once put into action, and for many years—in fact until the financial depression caused it to cease operation—it was the only check exercised upon the sale of commercial fertilizers. At the best the system was so clearly make-shift in its nature, and left so many points untouched that could only be dealt with under the authority of Parliamentary legislation, that in my annual report for 1897 I urged, with more insistence than before, the need of a Fertilizers Act. In 1890, twenty and a half years ago, while the Food and Drugs Act was passing the legislature, a discussion had arisen on the desirability of incorporating provisions relating to fertilizers therein, but the late Mr. Thomas Louw remarked that "guano and patent manures were of such importance that they should be dealt with separately". The House apparently endorsed this view and the subject was dropped, but years lapsed before discussion on that point was renewed, and when at length the Act saw the light seventeen years had gone by. During the session of 1896 the Government was questioned in Parliament as to its views on the desirability of introducing fertilizer legislation, and two years later Mr. P. Ryan, from his seat in the Cape Parliament, got the House to adopt a definite resolution to the effect

That Act 5 of 1890 (The Food and Drugs Act) should be so altered as to regulate the sale of guano and other fertilizers in this Colony; and that the Government be requested to give the subject its earnest attention during the recess, with the view of introducing such a measure early next session.

Accordingly a draft amending Bill, containing a number of clauses dealing with fertilizers, was published in 1899 as an appendix to the annual report of the Officer administering the Food and Drugs Act, but just then the war came and fertilizer legislation vanished absolutely.

In 1905 the Minister of Agriculture requested Mr. Ryan, who had by that time retired from Parliament, Dr. E. A. Nobbs, now Director of Agriculture in Rhodesia, and myself to act as a Committee to draft a new Fertilizers and Farm Foods Bill. The measure which was formally introduced in 1906, but, failing to pass, was reintroduced and passed in 1907, represented the principles adopted by the Committee, but the actual terms, as drafted by the Committee, were transferred from the Bill to the first set of regulations, viz., those of 1908, the Bill itself going little further than giving the Government

* Some hints on this and kindred points will be given on a later page.

power to frame regulations along the lines of the principles which the Committee had drafted.

THE 1907 ACT.

Except for its definitions, the Act is for the most part merely permissive, the Government being given the power—very extensive power, it is true—to frame regulations, instead of stereotyping those regulations in the body of the statute itself—an advantage which has since proved of great value in permitting a gradual moulding and adaptation to developing circumstances. The powers given, however, sketch out in the Act the general lines on which the regulations under the Act are to be framed. Thus it is indicated that the containing receptacles are to be branded, the brands registered, the registration certified to, and the sale of unregistered articles prevented. Sellers, moreover, are intended to supply their customers with guarantees of composition, articles not of the guaranteed composition, or of that asked for by the purchaser being precluded from sale. Regular analyses may be provided for, and the mode of procuring samples and of analysing them laid down.

The Act does not confine itself to fertilizers and farm foods, but likewise deals with seeds and pest remedies, the seed clauses having been mainly transferred from the Food and Drugs Act of 1890, wherein the Parliament of the day included them while declining to insert anything relating to fertilizers.

FERTILIZERS.

REGISTRATION.

Of the regulations newly published, which number 41 in all, the first 21 deal exclusively with fertilizers and farm foods. The first five regulations refer to the subject of registration, Nos. 6 to 15 deal with sales, and Nos. 16 to 21 with sampling and analyses. To the subject of farm foods we shall revert later as regards fertilizers. The first and foremost provision is that all fertilizers are to be registered with the Department of Agriculture, and this registration has to be renewed annually. The persons charged with effecting registration are, in the case of imported articles, the importer, and, in locally produced articles, the owner or manufacturer. Where a manufacturer outside the limits of the Cape Province consigns a fertilizer or farm food direct to the consumer within the Province—that is to say, without the intervention of a local firm—the extra-provincial manufacturer will be required to appoint a local agent to effect registration and accept responsibility as importer.

Attention may be drawn to the necessity of registering afresh all fertilizers for the year now entered upon. The registration certificates of the 1910 season ceased to be valid with the expiration of the calendar year, and each fertilizer needs to be specifically registered anew before it can legally be sold.

BRANDS.

In order to attain the objects of the Act, one of the first requisites is some figure, mark, or design, whereby the goods of any particular firm may be instantly recognized as such by intending purchasers. The brand may consist of words, letters, or symbols, or it may be a pictorial design, but in any case it must be sufficiently distinctive to establish a clear and exclusive connection between the article and the firm or person by whom it is registered.

From this it should be clear that names of fertilizers like "High grade superphosphate" or "Basic slag" cannot be employed as brands; no more can other designations like "potato manure" be so used. These are terms to which the applicant for registration cannot claim an *exclusive right*, and they consequently lack the specially distinctive character that is essential.

MISUSE OF PERCENTAGE NUMBERS.

No. 5 of the new regulations excludes from registration any name or brand in which the proportions or percentages of any fertilizing constituent in a fertilizer are stated or indicated numerically. This provision, which became operative fourteen months ago, prohibits the registration of such a name as, for example "sulphate of ammonia 85 per cent.". There is a twofold objection to accepting such a name for registration: it is most undesirable that in two fertilizers which contain, in almost identical proportions, one particular plant food constituent, there should be the possibility of using two widely different figures to denote those proportions. By absolutely prohibiting the use of figures this difficulty is avoided, but let me illustrate it more clearly.

One merchant—let us call him A—may offer for sale what he calls "sulphate of ammonia 20 per cent."; B may sell—probably at the same price—an article marked "sulphate of ammonia 23 per cent."; while C stocks "sulphate of ammonia 85 per cent.", and charges the same price as the other two. A farmer ignorant of the meaning of those figures may think that he is doing good business by purchasing C's 85 per cent. article in preference to the others, but the fact may be that he would have done better to have bought from B at the same price, and still better had he dealt with A. "But", he may reply, if one ventures to put him right, "A sells sulphate of ammonia of only 20 per cent. strength; how can that be better than B's 23 per cent., and C's 85 per cent."? 85 per cent., yes, but of what? A different complexion is put on the matter when the purchaser discovers that A's fertilizer contains 20 per cent. of *nitrogen*, B's 23 per cent. of *ammonia*, and C's 85 per cent. of *sulphate of ammonia*, and furthermore, that 20 per cent. of nitrogen means exactly the same thing as 24¼ per cent. of ammonia and 94¼ per cent. of sulphate of ammonia.

Another objection to the use of percentages in the names may be illustrated from some of our recent experiences. An article is registered, let us say, under the name of "45 per cent. sulphate of potash". On analysis it is found to contain potash to the extent of only 40 per cent. The farmer, misled by the figures in what may be called the official name, takes it to be of a higher grade than it really is. The plea in such a case is that "45 per cent." is supposed to be part of the name or brand, and not to indicate the actual composition of the fertilizer. Until the 1909 regulations under the Act were promulgated no legal objection could have been taken to such a misleading practice. How far the guileless may be led astray by the ingenious intermixture of names and figures may be shown by another case. A basic slag is described as "80 per cent. citrate-soluble". This would, on the face of it, seem to denote that the slag contains 80 per cent. of citrate-soluble phosphoric oxide. Any chemist would see the absurdity of such an interpretation at once, but not so the agriculturist, accustomed though he may be to less than 20 per cent. of citrate-soluble phosphoric oxide in the slag usually purchased by

him: hence he buys this one with alacrity. Analysis subsequently shows it to contain only 13 per cent. of citrate-soluble phosphoric oxide, and it turns out that the description should have been taken to convey the meaning that 80 per cent. of the phosphoric oxide in the slag is citrate-soluble: in other words, that, as the slag contained about 17 per cent. of phosphoric oxide in all, 13 per cent. would represent about 80 per cent. of that amount. This, I may add, is founded on an actual occurrence.

To avoid any such confusion all use of numbers in brands or names is prohibited, as above indicated, by regulation No. 5.

STATING OF PERCENTAGES.

The above remarks apply only to the *registered name* or *brand* of a fertilizer, not to anything that may be printed on any label or advertisement. There, of course, the use of figures representing the proportions of fertilizing constituents cannot be reasonably objected to; but at this point regulation No. 8 steps in and provides that in all such cases the exact fertilizing constituent designated must be referred to in explicit terms, and according to a uniform system of nomenclature, explained at more detail in a subsequent paragraph. Under this regulation the name of the constituent actually designated must always precede or follow the percentage number, and this name must, moreover, be one which is officially recognized.

Wherever the percentage of any fertilizing constituent is stated, single definite figures should be given, and not amounts ranging over ½ per cent. or more. Up to little over a year ago it was habitual in many cases to state the percentages somewhat in this way: 30-32 per cent. total phosphoric oxide; 4-4½ per cent. nitrogen; 45-50 per cent. potash. If in one case a range of 1 per cent. is given, in another there might be a range of 2 per cent., and in others 3 per cent. or more; and besides, the purchaser may consider an article which is marked 30-36 per cent. as superior to one marked 30-32 per cent., when all the while the former may contain just over 30 and the latter possibly 32. If, therefore, the vendor cannot guarantee exact proportions, he should take the lowest figure and register that and that only.

PHOSPHORIC OXIDE.

Some reference may now be made to each of the fertilizing constituents whose percentages in the fertilizer are required to be stated in the application for registration. We begin with phosphoric oxide.

A few years ago three samples of superphosphates, bought for analysis in the Government Laboratories through a commission agent under the old system, were found to have been marked by the firm's European representatives as shown in the first column of Table No. I below. The remaining four columns contain the results of our subsequent analyses:—

TABLE No. I.

Name.	Lime. Per cent.	Phosphoric Oxide. Per cent.		
		Total.	Citrate-soluble.	Water-soluble.
Superphosphate 26 per cent. ...	22·97	14·82	14·44	11·96
Superphosphate 30 per cent. ...	23·22	15·61	15·24	13·13
Superphosphate 37 per cent. ...	26·12	19·25	19·11	17·81

A year later three other superphosphates were procured from the same firm, and their analyses, as well as the manner in which the samples were labelled, are shown in Table No. II below:—

TABLE No. II.

Name.	Lime. Per cent.	Phosphoric Oxide. Per cent.		
		Total.	Citrate-soluble.	Water-soluble.
Superphosphate 12–14 per cent. ...	20·91	15·35	14·03	11·67
Superphosphate 14–16 per cent. ...	21·83	16·48	15·35	12·28
Superphosphate 17–18 per cent. ...	25·20	18·47	18·39	15·39

It is plain that by the 26 per cent. superphosphate of the former year was meant the same article as the 12 to 14 per cent. of the latter; the 30 per cent. and the 14 to 16 per cent. superphosphates were more or less similar; likewise the 37 per cent. corresponded with the 17 to 18 per cent., but farmers who are not acquainted with the different ways in which one and the same fact may be presented, would, not unnaturally, have taken a 26 per cent. superphosphate rather than a 17 to 18 per cent., and, as a result, would have had an article inferior to that which seemingly contained a much smaller proportion of the essential ingredient. And yet in one sense the method of labelling the superphosphates exemplified in the first of the above two tables may be quite as correct as that shown in the second. As in the case of the 20 per cent. sulphate of ammonia already alluded to, it entirely depends on what combination is meant when one declares that there is 26 per cent., and what particular combination is indicated by the 12 per cent. In the first table the articles had been labelled according to their percentages of tricalcium phosphate, and in the second according to their percentages of phosphoric oxide, and 31 parts of the former are approximately equivalent to 14 of the latter. Hence the very first set of regulations promulgated under the Act over two years ago insisted upon uniform methods of stating percentages. Hence, too, the need of seeing to it that the goods sold and bought are marked, so to speak, in plain figures.

It will be noticed that the registration form mentions three—or, more strictly speaking, four—classes of phosphoric oxide, but in no case is any other term used or recognized under the Act for the indication of phosphatic fertilizing constituents. Merchants, as well as farmers, should get into the way of consistently employing the term phosphoric *oxide*, as that expression clearly and without ambiguity denotes the fundamental constituent of all phosphatic manures. Such terms as "phosphoric acid" and "tricalcium phosphate", and especially the vague word "phosphates" ought to be rigorously avoided in connection with invoices and registers, for they do not always convey a clear and precise meaning. Moreover, it is not sufficient to state merely the "total phosphoric oxide" and leave the *soluble* phosphoric oxide out of account. In two fertilizers the respective totals may be equal, but one may contain much more water-soluble or citrate-soluble phosphoric oxide than the other, and hence be correspondingly more valuable.

With regard to the four forms or grades of phosphoric oxide that have to be taken into account, it may be said that the most valuable is the readily-soluble, or *water-soluble phosphoric oxide*. It is chiefly in this form that phosphoric oxide is present in superphosphates, and, generally speaking, in all "dissolved" phosphatic materials, such as "dissolved bones" and "dissolved guano". Next in value are the *citrate-soluble* and *citric acid-soluble phosphoric oxide*. The citric acid-soluble phosphoric oxide is the form in which the phosphates are mainly present in Thomas' or basic slag and in basic superphosphate, and a form corresponding to that in bone meal and other phosphatic fertilizers is represented by the citrate-soluble phosphoric oxide.* Last of all is the *insoluble phosphoric oxide*, which forms practically all the phosphate of bone preparations and mineral phosphates. *Total phosphoric oxide* is the sum of the citric acid-soluble (or citrate-soluble) and insoluble phosphoric oxide. Water-soluble phosphoric oxide is often spoken of as quick-acting phosphate, while insoluble phosphoric oxide is described as slow acting; for official purposes, however, the latter terms should not be used instead of the more precise expressions above mentioned. A further explanation is necessary with regard to the solubility of fertilizing constituents in citric acid and in citrate solution; for the former the solution used is of 2 per cent. strength as laid down by the regulations promulgated on the 27th December, 1906, by the Board of Agriculture and Fisheries (Great Britain) under the Fertilizers and Feeding Stuffs Act, 1906. For ascertaining percentages of citrate-soluble phosphoric oxide, Petermann's solution is employed, the preparation whereof is described in my report for 1896, p. 56.

One other point before passing on to the important subject of superphosphates. It should always be borne in mind that the citrate-soluble phosphoric oxide in a fertilizer includes, and is therefore larger in amount than, the water-soluble phosphoric oxide. Scientifically this is always and everywhere the case, but in other parts of the world, for the purposes of fertilizer legislation, the expression "citrate-soluble" is regarded as denoting not the *true* citrate-soluble phosphoric oxide, but the *difference* in amount between the latter and the water-soluble phosphoric oxide. So to regard it is not only scientifically incorrect, but leads to inconvenience and misunderstanding. No. 20 of the Cape regulations, therefore, defines citrate-soluble phosphoric oxide as including phosphoric oxide soluble in water, and this interpretation is to be placed upon the term whenever it is used for the purposes of these regulations.

SUPERPHOSPHATES.

Reference has been made above to the Regulation (No. 8) which prohibits the use of numerals in connection with the name of any fertilizer registered under the Act. The very next regulation makes an exception to this rule in respect of superphosphates, and not only does it specially except superphosphates from the operation of Regulation No. 8, but it does more; it expressly enforces with regard

* In applications for registration citric acid-soluble phosphoric oxide need be stated only in respect of basic slag and basic superphosphate; for other phosphatic fertilizers, and particularly for such fertilizers like superphosphates, where reversion is probable, citrate-soluble phosphoric oxide should be stated.

to superphosphates what Regulation No. 8 prohibits in the case of all other fertilizers. Briefly put, numerals indicating the minimum percentages of water-soluble phosphoric oxide present are a compulsory adjunct to the name of each superphosphate intended to be registered. All receptacles containing superphosphates must, by the provisions of Regulation No. 9, be clearly marked so as to indicate the exact quality of the contents. Five grades of superphosphates are recognized, namely:—

High grade, containing over 17 per cent. of water-soluble phosphoric oxide.

Medium high grade, containing from 15 per cent. to 17 per cent.

Medium grade, containing from 13 per cent. to 15 per cent.

Low grade, containing from 12 per cent. to 13 per cent.

Under strength, containing less than 12 per cent.

In each case the bag or other receptacle must be distinctly marked either "high grade", "medium high grade", "medium grade", "low grade", or "under strength". Furthermore, each receptacle is to be marked with the minimum percentage of phosphoric oxide which its contents are guaranteed to contain; thus, it will not be sufficient to mark a medium grade superphosphate which contains, let us say, 13.2 per cent. of water-soluble phosphoric oxide, simply "superphosphate, medium grade", and leave the purchaser to infer that it may perhaps contain close on 15 per cent. of water-soluble phosphoric oxide. It will be essential in all such cases to mark the figure "13.2 per cent." equally distinctly on the containing receptacle. It need scarcely be added that such percentage should also appear on the application for registration under the heading "Name".

The different ways in which it has been customary to state the proportions of the several components of fertilizers are nowhere better illustrated than in connection with superphosphates. The inconvenience and misunderstanding arising from such loose nomenclature have already been demonstrated by means of the tables in a preceding paragraph. It is often undesirable, where such loose habits have been long indulged in, and especially where legislation in the country of manufacture is not sufficiently explicit, to attempt a sudden transition to right lines; hence, for some time after the passing of the present Act, sellers of fertilizers were allowed to state, not only the amount of *phosphoric oxide* in their manures, but also the figure representing that amount if calculated as *tricalcium phosphate*. This was a concession to those who had been in the habit of stating their figures in the latter and not in the former way. At the same time, I pointed out from the first that the proper expression to use is *phosphoric oxide*, which is free from ambiguity. When we got as far as a successful introduction and a consistent employment of the correct term, the regulation permitting the use of the frequently misleading and often wholly incorrect and unscientific expression was dropped, and the words "the equivalent of the phosphoric oxide expressed as 'tricalcium phosphate'" were deleted from the registration form. It is now sufficient to state the percentages simply as "phosphoric oxide", and dealers are advised, if they have not already done so, to bring this to the notice of their correspondents across the water, and of their consulting chemists, in order that a consistent and uniform method of stating these results may be adopted by all.

The water-soluble phosphoric oxide in superphosphates has a

tendency to undergo what is called "reversion", that is to say, it changes from the water-soluble into a less soluble form. This less soluble form, however, still continues to be soluble in citrate solution. The change is, therefore, not shown by any increase of citrate-soluble phosphoric oxide in the fertilizer, but simply by a diminution of the water-soluble phosphoric oxide, that which was citrate-soluble at the start—and which, of course, includes all that was water-soluble—still continuing citrate-soluble. The extent to which this reversion proceeds, and the rapidity with which it takes place, depend partly upon the method of manufacture, but it is inherent in *all* superphosphates, and hence some allowance has to be made for it where the fertilizer has to be imported from distant countries, and much time is given for reversion to proceed between the time of manufacture and the time of delivery to the farmer. On the other hand, unlimited reversion cannot be condoned, and so Regulation No. 20 allows reversion to the extent of 2 per cent., together with a further margin of .5 per cent. for what are called "limits of error", a subject which will be explained later on. It may be necessary to illustrate how this principle works in actual practice. Suppose a superphosphate is guaranteed to contain 16 per cent. of water-soluble phosphoric oxide. It is sampled and analysed on arrival at Capetown, and is then found to contain only 13 per cent. An allowance of 2 per cent. for reversion would have brought the guaranteed figure down to 14 per cent., and a further margin for error would lower it still further, namely, to 13.5 per cent., but the sample in question shows only 13 per cent., and accordingly it has to be condemned as below guarantee. Take another case: Here, too, the guaranteed figure for water-soluble phosphoric oxide is 16 per cent., and at the same time the citrate-soluble phosphoric oxide in the fertilizer is guaranteed at 16.4 per cent.; on analysis the water-soluble phosphoric oxide is found to be 14.2 per cent., in other words within the limit allowed for reversion, but the citrate-soluble phosphoric oxide turns out to be only 14.5. Such a fertilizer would have to be condemned, for it is evident that as a matter of fact the reversion has been very small, but the grade of the superphosphate was below guarantee to begin with, as shown by the low percentage of citrate-soluble phosphoric oxide as compared with the amount guaranteed. A third example: Here also 16 per cent. of water-soluble phosphoric oxide is guaranteed, but on analysis we find that the *total* phosphoric oxide is 15.2 per cent. There is no need to proceed further, the article is condemned at once, for, reversion or no reversion, the water-soluble phosphoric oxide could never have been more than the total. The allowance for reversion does not come into account, and the fertilizer falls without the pale on the limit of error (.5 per cent.) alone. One more instance: In this, as in the other cases, the amount of water-soluble phosphoric oxide guaranteed is 16 per cent., and a guarantee of 16.4 per cent. is given for citrate-soluble phosphoric oxide; by analysis the superphosphate is found to contain 16.6 per cent. of citrate-soluble and 13.9 per cent. of water-soluble phosphoric oxide. This article is passed as satisfactory, for although the proportion of water-soluble phosphoric oxide is below the 2 per cent. margin for reversion it is not outside the additional .5 per cent. limit of error, and the citrate-soluble phosphoric oxide is fully up to guarantee.

There is one point more about these four illustrations that I wish

to emphasize: In two of the cases judgment could be pronounced without any reference to guaranteed figures for citrate-soluble phosphoric oxide, but in the other two cases, though less so in the fourth, such guarantees were of essential importance. Merchants should therefore see to it that in future applications for registration of superphosphates guarantees are given not only for the water-soluble but also for the citrate-soluble phosphoric oxide which their fertilizers contain. Without such guarantees for citrate-soluble phosphoric oxide it will be impossible to accept applications for the registration of superphosphates.

NITROGENOUS FERTILIZERS.

In this connection it should be noted that the nitrogenous constituents of any fertilizer should be stated in terms of the *nitrogen* which they contain and not as so much per cent. of *ammonia*, still less should loose expressions like " ammoniacal salts " be used. The manner in which such percentages are sometimes stated in connection with such an article as sulphate of ammonia has already been instanced. An article containing 23 per cent. of sulphate of ammonia contains about 4.8 per cent. of nitrogen, which is equivalent to about 6 per cent. of ammonia, but the figure to be registered is 4.8, and not 6 or 23.

Another of the requisites to be stated in applications for registration is " the form in which the nitrogen is present ". In many fertilizers it may suffice here to fill in the words " organic ", " ammoniacal ", or " nitric ", as the circumstances of the particular case may necessitate, but where mixed organic fertilizers are concerned, the form of the nitrogen should be more specifically stated, as for instance, leather meal, shoddy, fish or flesh, blood, horns, hair, etc. It is quite possible that 6 per cent. of nitrogen derived from such a substance as leather would be less valuable than 2 per cent. derived, for example, from dried blood.

It will, no doubt, be understood that the term *organic* is used where the nitrogen exists as animal or vegetable matter. *Ammoniacal* nitrogen, which is usually in the form of ammonium sulphate or chloride, is more readily available than the organic form.

One of the principal nitrogenous fertilizers is guano, and that word had got to be very loosely and improperly employed; a regulation has, however, been in operation for the last fourteen months with the object of preventing the misuse of the term " guano " in the labelling or advertising of fertilizers. It is provided that this word is not to be used except under certain rigidly limited conditions. It may be used only in connection with sea-bird guano, bat guano, fish guano, and whale guano, and its use is also permitted in connection with guano phosphate. In no case, except when it denotes sea-bird guano, may the word " guano " be used standing alone, and when thus employed to designate sea-bird guano its use is permissible only when the nitrogenous constituents are still present. The other three classes of guano above mentioned should not be described simply as " guano ", but must in every case be preceded by the appropriate descriptive term, i.e. either " bat ", or " fish ", or " whale ". If the nitrogen constituents have disappeared from guano it may no longer be described as such; the practice was to describe such an article as " phosphatic guano "; this term must now be replaced by " guano phosphate ".

POTASH.

Potash, like phosphoric oxide, may be present in fertilizers in several forms, considered with respect to their condition of availability for plants. First of all there is water-soluble potash which includes the *potash salts*. These commonly go by the names of sulphate of potash, kainit, muriate of potash, chloride of potassium, or sylvinite. Then there are the *organic* forms of potash; amongst these are such articles as tobacco stems, cotton seed hulls, beet-sugar factory refuse, and so on: these are soluble only in acids. Finally there is *felspathic potash* and other materials of similar nature which are, for all practical purposes, insoluble. It is obvious, therefore, that in all fertilizers the *form* in which the potash is present is an important element, and above all in mixed fertilizers a statement should be made as to whether the potash is there as potash salts, or as wood ashes, or in whatever other condition it may exist.

With respect to potash the same principle holds good which has already been indicated in connection with phosphoric oxide and nitrogen; the percentage to be stated should not be that of the potash salt *as such*, e.g. as sulphate of potash, muriate of potash, etc., but that of the *potash* which is the essential constituent thereof. The potash contained in sulphate of potash amounts approximately to 54 per cent. of the latter, so that to convert the percentage of "sulphate of potash" into "potash" all that has to be done is to multiply the former by 54 and divide by 100. An article, therefore, that contains say 90 per cent. of the sulphate would contain 48.6 per cent. of pure potash, and this is the figure that should, in such a case, be inserted in the application for registration.

To state that a fertilizer contains a certain percentage of "potash salts" is vague, unsatisfactory, and misleading; still more objectionable is the use of the term "alkaline salts".

LIME.

Generally speaking, it is not the usual practice in other lands to take much account, at all events for valuation purposes, of the amounts of lime present in fertilizers, but, with the many soils in the Cape Province that betoken decided evidences of the lack of lime, the importance of that substance as a direct plant food has come to be more definitely realized in practical experience than has been the case elsewhere. Hence it has been regarded as of sufficient moment to require a statement of the proportion of lime contained in fertilizers to be made by applicants when submitting such fertilizers for registration.

SOURCES OF CONSTITUENTS.

When dealing in an earlier paragraph with the subject of nitrogenous manures, and again when referring to potash, remarks were made to show the necessity of having clear statements with regard to the form in which this or that constituent of a manure is present. It is quite possible that, unless such a declaration be made, fraud may be perpetrated, although all the while a correct statement of the constituents—as far as mere figures go—is given. What this means may be gathered from the following example: two fertilizers may be each stated—and quite correctly—to have the following composition:—

Nitrogen	$1\frac{3}{4}$	per cent.
Potash	$2\frac{3}{4}$	,,
Phosphoric oxide	$9\frac{1}{2}$	,,

A mixed fertilizer of approximately the above composition may be obtained by compounding together the following ingredients:—

225 lb. of nitrate of soda, containing $15\frac{1}{2}$ per cent. nitrogen;
425 lb. of kainit, containing $12\frac{1}{2}$ per cent. potash; and
1350 lb. of dissolved phosphate, containing 14 per cent. phosphoric oxide;

and the fertilizing value of such a mixture may be considerable.

But a comparatively valueless fertilizer, containing exactly the same percentages of nitrogen, potash, and phosphoric oxide, may be prepared by substituting leather meal for nitrate of soda, powered felspar for kainit, and ground apatite or phosphate rock for dissolved phosphate.

In most of the United States of America the incorporation into commercial fertilizers of such substances as ground leather, horn shavings, feathers, hair, wool waste, or muck, nitrogenous—and even highly nitrogenous—though they may be, is prohibited for the reason that these articles, which have no effective value, when present mislead the purchaser into a belief that the nitrogen which they contain and which he sees paraded on the invoice is of real use for fertilizing purposes.

MECHANICAL CONDITION.

The coarser the state of sub-division of a fertilizer, other things being equal, the less suitable it will be for promoting the growth of the crop. A fertilizer which is in a sufficiently finely divided state to be capable of passing in its entirety through a sieve with $\frac{1}{8}$-inch holes is more valuable and efficient for its purpose than one the bulk of whose particles are so coarse that anything finer than a $\frac{1}{4}$-inch sieve will not allow them to pass through. Although with water-soluble manures, like nitrate of soda, sulphate of potash, and sulphate of ammonia, this point is of comparatively little moment, it is of more importance in dealing with bone-dust or bone-meal, which should invariably be of sufficient fineness to permit of at least 80 per cent. thereof passing through a sieve of eight meshes to the linear inch, and it becomes a matter of great importance in mixed fertilizers, especially if organic, while with basic slag sufficient fineness of division is paramount. At least 75 per cent. of the slag should pass through a wire sieve of 100 meshes per linear inch, if coarser than this its value is correspondingly depreciated. In Western Australia the sale of bone-dust or bone-meal which does not conform to the condition of permitting at least 80 per cent. to pass through a sieve of eight meshes per linear inch was made an offence under the Fertilizers and Feeding Stuffs Act, 1904, of that Colony, and the regulations which were promulgated here fourteen months ago make this condition compulsory in the Cape Province as well; the condition is continued in the regulations recently promulgated. Another of the regulations put into operation in November, 1909, is that basic slag must be sufficiently fine to permit of at least 75 per cent. thereof passing through a sieve of 100 meshes to the linear inch. Any article sold in the Cape Province under the names of basic slag, Thomas' phosphate, or Thomas' slag must now conform to this regulation. The present regulations which deal with the mechanical condition of fertilizers are Nos. 11 and 12.

INVOICE CERTIFICATES.

Regulation No. 6 provides that the vendor of any fertilizer shall furnish his customer with a statement of the component parts of the

article, and, by way of illustrating how this is to be done, a blank form is printed. All terms or expressions which may, however undesignedly, mislead or confuse the purchaser should be scrupulously avoided in filling up such an invoice certificate. The absolute necessity of uniform nomenclature, which has been emphasized in the preceding pages, will be borne in mind in this connection. Under "nitrogen" the percentage of nitrogen, and not of ammonia or of sulphate of ammonia, should be inserted. Under "potash" there should be an equally definite statement; sulphate of potash, muriate of potash, or chloride of potassium are substances of which no cognisance can be taken. The column headed "lime" should be simple enough to fill in, but even here mistakes are often made; for instance, in respect of basic slags, the figure given is often that for free lime instead of for *total* lime, i.e. both free and combined; and in the forms of application for registration a similar error is committed. The explanations which have been made with regard to phosphoric oxide should be well studied, and for the reasons which have already been enlarged upon it is of course not enough to give merely the "total phosphoric oxide". Perhaps the need of careful discrimination will be grasped all the better by farmers by the aid of another illustration. Four fertilizers are invoiced as each containing "Total phosphoric oxide 10 per cent.", and so far the invoice may be absolutely correct. One of the four fertilizers, however, is an insoluble phosphate-rock powder, in which practically all the phosphoric oxide is insoluble: the second may be a preparation of basic slag containing most of its phosphoric oxide in the citric acid-soluble condition; a third may be reverted superphosphate wherein the phosphoric oxide is nearly all in the citrate-soluble state, but with very little thereof soluble in water; the fourth, perhaps, consists largely of dissolved bone, in which the bulk of the phosphoric oxide is water soluble. No. 4 would be altogether the most valuable of the four, and No. 1 the least, if their composition were as follows:—

	No. 1. Per cent.	No. 2. Per cent.	No. 3. Per cent.	No. 4. Per cent.
Water-soluble phosphoric oxide	0·25	0·25	0·50	8·00
Citrate-soluble phosphoric oxide	0·75	- -	9·00	1·50
Citric acid-soluble phosphoric oxide	—	8·00	—	—
Insoluble phosphoric oxide	9·00	1·75	0·50	0·50
Total phosphoric oxide ...	10·00	10·00	10·00	10·00

The invoice certificate provided for a clear statement as to solubility in (1) water, (2) citrate solution, and (3) citric acid, the difference between (2) or (3) and (4) total phosphoric oxide being naturally that which is insoluble. The purchaser has a right to expect that the figures on the invoice are so plainly stated as to entail the least possible calculation, if indeed any at all, on his part in order to ascertain how they would be affected by being expressed in the terminology of the regulations. In other words, as it is put in a circular issued for similar purposes to the present notes by the Department of Agriculture and Technical Instruction for Ireland (Leaflet No. 17, revised): "When an analysis is not stated in a proper

manner, it is unnecessary for the purchaser to convert 'sulphate of ammonia' into 'nitrogen', 'sulphate of potash' into 'potash', etc.; instead, he should compel the seller to give him an invoice made out according to the requirements of the Act. Any farmer who cannot obtain a proper invoice when purchasing manures should immediately report full particulars of the case to the Department."

TRADE MISDESCRIPTIONS.

Below are given a few instances of the way in which manufacturers very frequently state the composition of their fertilizers, and opposite to each is indicated the correct manner of stating the proportions of the active constituents.

Article.	Manufacturer's Description.	Corrected Statement.
Sulphate of ammonia...	94 per cent. purity	Nitrogen, 19½ per cent.
Sulphate of ammonia...	20 per cent. ammonia	Nitrogen, 16½ per cent.
Muriate of potash ...	Muriate of potash, 80 per cent....	Potash, 50 per cent.
Sulphate of potash ...	Sulphate of potash, 91 per cent....	Potash, 49 per cent.
Superphosphate ...	Superphosphate, 35 per cent.; or soluble phosphates, 35 per cent.	Water-soluble phosphoric oxide, 16 per cent.
Bone flour	Bone phosphates, 60 per cent....	Phosphoric oxide, 27½ per cent.

The following is an example of what may be called an utterly misleading manner of stating the composition of a fertilizer:—

Total phosphates	14	per cent.
Soluble phosphates	12	,,
Sulphate of ammonia ...	7	,,
Potash salts	10	,,

These figures look big enough at a rapid glance, but the glamour is much diminished when they are more scientifically stated as follows:—

Citrate-soluble phosphoric oxide ...	6¼	per cent.
Insoluble phosphoric oxide	1	,,
Nitrogen	1½	,,
Potash	1⅓	,,

Figures thus given occasionally need very close scrutiny. The following was given as the composition of a fertilizer sold in the State of New York for £5. 4s. 2d. per ton:—

Total phosphoric oxide	22.21	per cent.
Insoluble phosphoric oxide ...	20.81	,,
Available phosphoric oxide ...	1.40	,,
Potash soluble in water	0.13	,,

In this case it was the first two lines that were intended to catch the eye, but all that was worth having was contained in the third and fourth lines, and that was exceedingly little; the fertilizer was not worth more than about 6s. per ton.

Just here a hint or two may be given in regard to the advertising of special brands of fertilizers as particularly suited to special crops. In one of the opening paragraphs mention was made of a certain article misdescribed as a potato fertilizer; it contained lime, phosphoric oxide, nitrogen, and potash in the proportions of 10: 8: 2½: 3,

whereas the proportions in which these fertilizing constituents are required by the potato are 10: 20: 40: 60. Professor Whitney, of the United States Department of Agriculture, in a similar connection,* makes the suggestion that the word "potatoes" should be prohibited on any special brand for potatoes unless at least 6 per cent. of potash is contained in the fertilizer, and this in the form of sulphate only, that being the form in which potash is believed to be best suited to the potato. As a matter of fact, special potato fertilizers are being offered for sale which contain not more than 2 or 3 per cent. of potash. Professor Whitney also suggests that the word "tobacco" should be prohibited on fertilizers which do not contain at least 6 per cent. of potash in the form of carbonate. It is in that form that potash is considered best suited for tobacco, yet in most cases it does not seem to be present in the "special tobacco fertilizers" in that form, and the total potash in many "tobacco fertilizers" is not above 1 to 3 per cent.

Other misdescriptions are of a more general nature. Their character may be illustrated by two prohibitions in operation in the State of Georgia, U.S.A. There the word "standard" may not be used in connection with a fertilizer containing less than the commercial equivalent of 8 per cent. of phosphoric oxide, 2 per cent. of ammonia, and 2 per cent. of potash, nor may the term "high grade" be applied to a fertilizer containing less than 10 per cent. of phosphoric oxide, 2 per cent. of ammonia, and 2 per cent. of potash.

FERTILIZERS TO BE TRUE TO NAME.

It is desirable to emphasize certain points which relate in particular to four or five special classes of fertilizers. Certain trade names have acquired definite meanings, and when articles are purchased under those names the purchaser has a right to expect that the implied conditions are fulfilled in respect of the article purchased. Thus *bone meal*, if genuine, will contain from 22 to 26 per cent. of phosphoric oxide (total) and from 3¼ to 4 per cent. of nitrogen. When phosphoric oxide is low in a bone meal nitrogen is high, and when nitrogen is low phosphoric oxide is high in proportion. If in any article sold as "bone meal", these conditions are not fulfilled, such an article is probably not what it claims to be. *Steamed bone flour* should, as to its mechanical condition, be of the fineness of flour, and, as to its chemical contents, consist of from 27 to 30 per cent. of phosphoric oxide with nitrogen ranging from 1 to 2½ per cent. *Dissolved bones* ought to be pure, that is to say, free from everything except natural bones and sulphuric acid. *Thomas' slag* or *basic slag* (*Thomas' phosphate*) should be of the fineness specified above, and at least 80 per cent. of its phosphoric oxide should be soluble in a 2 per cent. solution of citric acid.

These are points that should be borne in mind in connection with Regulation No. 14, to the effect that no person shall sell any fertilizer not of the composition or *nature* demanded.

Manufacturers are presumed to be acquainted with the composition of their fertilizers: they are free to make whatever guarantee they please, but there is nothing arbitrary when once such a guarantee is made in requiring that the essential character of the fertilizer shall

* "Composition of Commercial Fertilizers", U.S.A. Department of Agriculture, Bureau of Soils, Bulletin No. 58, p. 9.

conform to it. It may be at times that through imperfect mixing one ingredient is low in proportion.*

In such cases the other ingredients should be correspondingly high. Such samples may be considered as equal in *value* to the legal guarantee.†

In the State of Indiana, U.S.A., commercial fertilizers have been considered as divisible into the following nine classes:—

1. Equal to guarantee in every particular.
2. Equal to guarantee in value.
3. Within 10 per cent. of value of guarantee.
4. Not within 10 per cent. of value of guarantee.
5. With one or more ingredients 20 per cent. below guarantee.
6. With one or more ingredients 30 per cent. below guarantee.
7. With one or more ingredients 50 per cent. below guarantee.
8. With one or more ingredients 60 per cent. below guarantee.
9. With one or more ingredients 70 per cent. below guarantee.

In that State an annual list is published stating the names of the firms whose fertilizers have been examined during the year, and classifying the fertilizers of each such firm on the above basis. What is meant by class No. 2 has already been explained. Fertilizers of class No. 3, although not considered as showing deliberate intent to defraud, are nevertheless such as do not give purchasers full value, and proportionate compensation could therefore be reasonably claimed. Class No. 4 betokens inexcusable carelessness, gross ignorance, or fraudulent intent. The fertilizers of the remaining classes are of essentially different character from what they claim to be, even though, as may sometimes prove to be the case, bad mixing is responsible for this.

It remains to add that the Indiana fertilizer law is, in its essential principles, the same as that of the Cape Province. Every person desiring to offer for sale material for manurial purposes is required to file with the State Chemist an application, and to register the brand of the fertilizer and its guaranteed composition.

Complete fertilizers, that is to say, those which aim at supplying the crops with nitrogen, potash, and phosphoric oxide,‡ are frequently classified on a commercial basis into different grades. The classification adopted in New York State, U.S.A., is arranged on the values stated below, the average composition being added in each case.

Class.	Commercial Value. Per ton.	Nitrogen. Per cent.	Available Phosphoric Oxide.§ Per cent.	Potash. Per cent.
Low grade	Below £3. 6s. 6d.	1·22	8·18	2·60
Medium grade ...	From £3. 6s. 6d. to £4. 6s. 4d.	1·70	9·10	3·48
Medium high grade...	From £4. 3s. 4d. to £5. 4s. 2d.	2·47	8·82	6·02
High grade	Above £5. 4s. 2d.	4·00	8·36	7·22

* Defects arising from such a cause are sought to be eliminated when samples are taken for check analysis by Government, firstly by a very thorough system of sampling—see Regulation No. 18—and secondly, by the system of proportionate allowances known as the "limits of error"—see Regulation No. 19.

† This principle, it must be remembered, can be acted on only within reasonable limits: one fertilizing ingredient cannot take the place of another.

‡ If they contain every ingredient in which a Cape soil may possibly be deficient, the proportion of lime also becomes a consideration.

§ i.e. citrate-soluble.

It may be of value to importers of fertilizers from England to say just here that section *eight* of the Imperial Fertilizers and Feeding Stuffs Act of 1893 provides that " the expressions ' soluble ' and ' insoluble ' shall respectively mean soluble and insoluble in water ".

SAMPLING FOR ANALYSIS.

Regulations Nos. 16 to 21, as previously observed, treat of the subjects of sampling and analysis. Fertilizers may be sampled under three conditions: Regulation No. 16 enjoins upon Government the duty of taking a sample of every registered fertilizer once in twelve months for the purpose of analysis; Regulation No. 17 provides for the detention for examination of imported fertilizers by an Officer of Customs; Regulation No. 37 deals with the procedure to be observed when any private person wishes to take for analysis a sample of any fertilizer which he may have purchased. The procedure to be followed in each of these three cases differs somewhat from that of the others; it will therefore be worth while considering the three cases *seriatim*.

It is the duty of the Government to sample and cause to be analysed every fertilizer registered with the Department of Agriculture at least once a year. Such samples are to be purchased at the vendors' respective places of business, and after the purchase has been effected the sample must be divided into three parts, all of which are to be duly sealed. One such part is to be handed to the vendor, one retained by the purchaser, and one dispatched to the official analyst, who must straightway further sub-divide his portion into two parts, sealing the one for production in Court if needed, and analysing the other. Circumstances have hitherto rendered it impracticable to carry out this regulation except in a very few cases, the provisions of Regulation No. 17 having been availed of in most cases for the double purpose.

The second method of obtaining check samples, namely, through the Customs, has been in very effective operation during the year now closed. Over 200 samples were taken, and, although it has not been found possible, or even necessary, to analyse all of these, yet most of the samples were analysed, and the results of 112 have since been published in the *Cape of Good Hope Agricultural Journal*, Vol. 37, pp. 426-444. It has been deemed desirable to promulgate regulations for sampling fertilizers taken under the conditions last named, and the regulation in question (No. 17) has been founded upon that of the British Board of Agriculture bearing on the subject. That regulation was promulgated on the 27th December, 1906. The substance of the provisions for sampling, as they appear in the newly promulgated Cape regulations, is as follows:—

Three cases are dealt with: (1) Where the fertilizers are contained in bags; (2) where they are delivered in bulk; and (3) where they consist of bulky, uneven, and possibly matted material, such as shoddy, wool refuse, hair, etc. In the first case the regulation provides that a number of bags or packages are to be selected from different parts of the whole stock of the fertilizer whose composition is to be ascertained. Where the entire quantity to be sampled is less than one ton, at least four bags of packages are to be taken; at least six bags must be taken if the whole stock is between one and two tons in quantity; if it is between two and three tons, eight bags must be selected, and two additional bags for every ton over and above three tons, provided that in no case need more than ten bags or

packages be selected. Into each of the selected bags a sampling spear, 18 inches in length and one inch in diameter, is to be pressed from the mouth of the bag to the extreme length of the sampling instrument. The several quantities thus taken from the selected bags are to be thoroughly mixed together, and a sample, about 2 lb. to 6 lb. in weight, is to be taken from the mixture.

In the event of the fertilizer being in bulk, a number of separate samples, proportionate to the whole stock under inspection, just as in the case of the bags, must be taken from different parts of the consignment, thoroughly mixed, and from two to six pounds of the mixture set aside.

Should the fertilizer be bulky and uneven, a similar selection is to be made from different parts of the consignment, the several portions thoroughly mixed, and a composite sample of not less than six pounds weight finally taken from the mixture.

In each of the three cases, the final sample must be divided into three parts and sealed, as already detailed in connection with the annual Government inspection in an earlier paragraph.

A third occasion for sampling may arise, namely, that originated by the private purchaser. Such purchaser, if he intends to have the article purchased analysed, must, within seven days after effecting his purchase, notify the vendor of his intention, and offer to divide the fertilizer into three parts before competent witnesses, at the place of delivery. If the vendor does not accept the offer within ten days, the purchaser may draw a sample before a resident magistrate, civil commissioner, or other competent witness, and send such sample—or, in case it has been divided into three parts, send one of those three parts—to an analyst appointed under the Act.

In addition to the above, competent officers have the right of searching premises and seizing samples should they have reasonable ground for suspecting deliberate evasion of the law; in such cases the method of sampling would not differ materially from that adopted in connection with the annual inspection by Government.

ANALYST AND EXPERT ADVICE.

First of all there is the analyst originally consulted by, or in the employ of, the manufacturing firm. That firm, or the correspondents of such firm in South Africa, should be most careful to make their analyst fully acquainted with all the requirements of the local Act and regulations. In many cases certificates are faultily filled in, for no other reason than that our practice differs from that of the country where the consulting analyst resides, and he has not been informed to that effect. The consequence is that much delay is occasioned in having mistakes rectified. As a rule it has not been deemed necessary to interfere with the sale of such a fertilizer, leniency of administration being advisable while those concerned are gradually acquainting themselves with the unfamiliar provisions of a law which involves radical alterations of existing practices. But such leniency cannot continue indefinitely, and it may happen that serious consequences may ensue from failure to comply with provisions which have now been operative for about three years, and which have been constantly referred to in articles such as this and in direct correspondence with interested firms. It is, therefore, advisable to avoid the risk of demurrage by having all

the papers in order at the start, and to this end clear understanding on the part of the professional chemist who advises the vendors or their European correspondents is essential.

Amongst the matters to be brought to the notice of consulting analysts is the manner in which manurial components are to be stated in certificates, e.g. phosphoric oxide and nitrogen instead of phosphates and ammonia. The need of stating the forms in which potash and nitrogen are present in a fertilizer is often overlooked, the percentage of lime is scarcely ever given, and in view of the reversion of superphosphates omission to include citrate-soluble phosphoric oxide in the list of percentages enumerated may also bring about avoidable delay in the future. All these points should therefore be placed before the analyst by whose advice the firm is guided.

It is one of the objects of the present paper to endeavour to elucidate the principal features of the Act and of the regulations framed thereunder, and any further matters of detail which, to either farmer or merchant, may nevertheless appear in any way uncertain or obscure, will be gladly explained on application at the offices of the Department. At the same time, merchants will readily understand that, in regard to the filling in of the registration forms, points may arise which can scarcely be settled by one outside of or unacquainted with the details of their own private business connections, otherwise than as a direct professional adviser; and firms will, of course, under such circumstances, and in their own interests, naturally consult a private analytical chemist, or be guided by such advice as their European correspondents, themselves acting under the guidance of their own consulting chemists, would give. Unless they put themselves out to seek such expert advice they may innocently incur serious liabilities; they may offer for registration high percentages which cannot possibly be maintained in the average of their consignments. Hence the importance of their making quite sure of their ground by obtaining wherever such is not furnished them by their representatives abroad, reliable analyses of average samples of their goods. Such analyses very naturally must not be sought, as they sometimes are, at the hands of the Government Analysts, firstly because their functions are those of inspectors and referees, and secondly because of the undesirability of Government competition with the practice of private chemists. On the other hand, there are doubtless many other matters on which the Government Analysts may, without prejudice, give advice, and indeed it is with a view to lessen any difficulties that may fall under this category that the present memorandum has been drawn up for the information of merchants and others interested. These may in the meantime rest assured that no arbitrary action will be taken by the Government, and that all possible information will be supplied on any points that are at all obscure.

Where any question exists as to the true composition of any fertilizer which it is intended to register, steps would no doubt be taken by the merchant to have it analysed locally by a private analyst, who would be asked to furnish the analytical results in the form required by regulation.

As to the analyst officially appointed to deal with samples procured under the Act, the procedure to be adopted in submitting samples to him has already been described; it remains to add in this

connection that two such analysts are stationed at Capetown and two at Grahamstown. Regulation No. 36 prescribes the fees payable by private purchasers who wish to have their fertilizers analysed, and Regulation No. 16 affords any vendor or other person an opportunity of obtaining an analyst's certificate in connection with any fertilizer analysed consequent upon the annual inspection by Government, provided such person pays a fee of five shillings.

The official analyst is required to divide into two parts any fertilizer received by him under the Act, retaining one such part sealed for subsequent production if necessary. All results of analyses, whether registered by the vendors or obtained after examination in the Government laboratories, are to be published, together with the names of the responsible firms, in the *Government Gazette* and in the *Agricultural Journal*.

The Government Analysts are occasionally asked by merchants to provide them with formulae for making up mixed fertilizers for special purposes, such as potato manures and fruit fertilizers. In addition to the reasons already given, there are other circumstances which render it undesirable that the Government should prescribe formulae for such purposes. So much depends upon the soil and site, for instance, that a fertilizer made up according to recipe may answer in one locality and be nothing but a disappointment in another, and if, after adopting a prescription drawn up under these circumstances failure follows in the wake, nothing would be easier than to blame the Government. It would be altogether invidious and undesirable for the Government Analysts to make special recommendations of such a nature to individual firms; these belong to the category of subjects that would very well come within the province of a private professional adviser.

LIMITS OF ERROR.

A passing reference to this subject, dealt with in Regulation No. 19, has already been made. The impossibility of absolute uniformity in mixing and other circumstances render it undersirable to hold manufacturers too rigidly to their guaranteed percentages. A margin for error is therefore provided, fertilizers being deemed sufficiently in accord with their guarantees if, although below such guarantees, they are not outside the prescribed margin.

For *water-soluble phosphoric oxide* a sliding margin of from 1 to 2 per cent. is allowed in the case of pure dissolved bones with a total of 16 per cent. or more of phosphoric oxide. In all other cases of dissolved bones, and of other bone compounds, compound manures, and superphosphates, the margin is .5 per cent. superphosphates having also the additional allowance for reversion amounting to 2 per cent. Basic slag is allowed a limit of 1 per cent. for *phosphoric oxide soluble in citric acid*. A similar allowance is given for *total phosphoric oxide* in basic slag, bones, fish guano, and meat meal. The allowance in dissolved bones of lower percentage than 16, and in Peruvian guanos of less than 15 per cent. total phosphoric oxide, is 1.5 per cent. If in the Peruvian guanos the total phosphoric oxide is guaranteed above 15 per cent. the allowance is increased to 2.5 per cent. An allowance of 1 per cent. of *nitrogen* is made in the case of shoddy, wool, hair waste, and of Peruvian guano with a guaranteed nitrogen percentage exceeding 5 per cent. In all other nitrogenous fertilizers the limit permitted for nitrogen is .5 per cent. below guarantee, except in Peruvian guanos whose nitrogen is stated at between 3 and 5 per cent.;

in the latter case the allowance for error is .75 per cent. The widest margins are allowed in the case of lime; it is as high as 5 per cent. for basic slags, basic superphosphates, and compound manures other than bone compounds. For superphosphates the allowance is 2 per cent., and in all other cases 3 per cent.

The meaning of the table may be more clearly explained by an example or two. If a superphosphate is guaranteed to contain a minimum of 15 per cent. of water-soluble phosphoric oxide but actually contains less than that amount, no liability will attach to the vendor unless the percentage be found to fall below 14.5 per cent. In the case of a potash salt guaranteed to contain 18.5 per cent. of potash, the seller will not be liable unless the percentage should fall under 16.5.

On a previous page attention was drawn to one of the provisions regulating the sale of superphosphates, in pursuance of which both the registration certificate and the receptacle containing the fertilizer are to be marked with the minimum percentage of water-soluble phosphoric oxide which the superphosphate is guaranteed to contain. The above table of limits of error makes it obvious that such minimum percentage must in no case fall more than .5 per cent. below the percentage guaranteed in the detailed analysis of the fertilizer; that is to say, the " grade minimum ", to coin a concise expression, must not be more than .5 per cent. below the guaranteed percentage.

USEFUL FACTORS.

It is quite probable that merchants may in some cases feel that there is no need to incur the expense of having their wares analysed over again, as they are prepared to stand or fall by the percentages guaranteed by their representatives in Europe; and yet those percentages may have been put in a form that would not be acceptable under the Cape regulations. Where this feeling exists, and the figures are not in the form required by the regulations, they may be simply adapted to suit the needs of the latter. If, for instance, the proportion of tricalcium phosphate is stated instead of that of phosphoric oxide, the former may be converted into the latter by a simple arithmetical process, and this principle is applicable to many of the fertilizers on sale. A few illustrations hereof are the following:—

To convert sulphate of ammonia into nitrogen: Multiply by 14 and divide by 66.

Ammonia into nitrogen: Multiply by 14 and divide by 17.

Muriate of ammonia (Chloride of ammonium) into nitrogen: Multiply by 28 and divide by 107.

Nitrate of soda into nitrogen: Multiply by 14 and divide by 85.

Nitrate of potash into nitrogen: Multiply by 14 and divide by 101.

Nitrate of potash into potash: Multiply by 94 and divide by 202.

Sulphate of potash into potash: Multiply by 94 and divide by 174.

Carbonate of potash into potash: Multiply by 94 and divide by 138.

Muriate of potash (Chloride of potassium) into potash: Multiply by 94 and divide by 148.

Tricalcium phosphate (Phosphate of calcium, Tribasic phosphate of lime, or Bone phosphate) into phosphoric oxide: Multiply by 142 and divide by 310.

COMMERCIAL VALUATION.

Before passing away from the consideration of fertilizers a few remarks appear needful in regard to this important part of fertilizer inspection work. The commercial valuation of a fertilizer is always based upon its results as yielded on chemical analysis: it consists simply in calculating the trade value of the fertilizer as made up of the sum of the trade values of its different ingredients, viz., nitrogen, phosphoric oxide,* potash, and lime.

Let us take a concrete case: imagine a fertilizer to be composed as follows:—

Lime	19.16	per cent.
Potash	1.52	,,
Nitrogen	2.78	,,
Phosphoric oxide ...	10.67	,,

Assume the trade values of the ingredients to be such that 1 per cent. of each has the following values:—†

	s.	d.
Lime	0	5
Potash	5	5
Nitrogen	10	0
Phosphoric oxide	5	5

Then the value of the imaginary fertilizer (per ton) would be arrived at as follows:—

				£	s.	d.
Lime	10d.	× 19.16	=	0	7	11½
Potash	5s. 5d.	× 1.52	=	0	8	3
Nitrogen	10s. 0d.	× 2.78	=	1	7	9½
Phosphoric oxide ...	5s. 5d.	× 10.67	=	2	17	9½
Value of mixed fertilizer per ton ...				5	1	9½

To this should be added a suitable margin for conveniences resulting from the supply of such an article ready mixed, etc. Now, there are certain definite advantages obtained by thus assigning commercial values to fertilizers; they show whether a given fertilizer is worth what it costs the farmer; even if it costs 20 to 25 per cent. more than its valuation it may still be economical to purchase it, but the more the cost exceeds the valuation the less wise such a purchase will undoubtedly appear to be. Then comparisons between the valuations and sale prices of a series of fertilizers of the same type will indicate which of these gives the best value for money. It should, of course, always be borne in mind in this connection that although to a certain extent, taking account of the *forms* in which nitrogen, phosphoric oxide, etc., are present in the fertilizer, this can be done only to a limited extent, and hence commercial valuation must never be taken as a hard and fast standard.

FARM FOODS.

Many of the regulations which deal with fertilizers also embrace farm foods—or, as they are known in some other countries, feeding

* Insoluble phosphoric oxide in superphosphate is not valued.

† These, it may be explained, are what are called the "unit values" of the several active components, and are deduced from the ruling market values of such standard articles as superphosphate, bone meal, sulphate of ammonia, and kainit. Those given above are not to be taken as necessarily representing present local values.

stuffs—within their scope. Many of the remarks, therefore, which have been made in respect more particularly of fertilizers, are applicable to farm foods as well. Like fertilizers, they have to be registered annually under a definite and distinguishing brand. As in the case of fertilizers, invoice forms, properly filled in, must be handed to the purchaser whenever a farm food is sold, or dispatched to such purchaser at the first opportunity.

FOOD CONSTITUENTS.

Both in the registration and in the invoice forms the constituents of farm foods are classified under the four heads of proteins, fat, carbohydrates, and fibre. In the briefest possible words the significance of these terms may be described. Food has two chief uses: (1) It builds up the body and repairs any waste that occurs from time to time; and (2) it supplies the body with heat and power, in other words, it acts as a fuel. It falls principally to the proteins to provide the first of these two functions of food; they build up the muscles, the tendons, the skin. But they do more than this, they provide the body with energy. The fats and carbohydrates cannot build up the body as the proteins do; they can only, by their combustion in the body, supply the warmth and power which it needs. The proteins also undergo combustion, supplying heat, and, where an insufficiency of carbohydrates and fats is given to an animal, the proteins are used up in this way. A good supply of fats and carbohydrates accordingly saves the proteins from being used up too rapidly.

It will be seen from the above that all three, proteins, fats, and carbohydrates, are of value to the body to keep up its warmth; that is to say, they are of value as fuel. But they are not of *equal* value in this respect. As the proteins are the chief builders-up of the body, so the fats and carbohydrates are the chief fuel ingredients in the food—the fats on account of their concentration, the carbohydrates, as a rule, on account of their quantity. The fuel value of the different constituents of food is measured as "calories". The exhaustive practical experiments of the Experiment Station Office of the United States Department of Agriculture have led to the conclusion that one pound of proteins may be valued at 1820 calories, and that the same value may be assigned to one pound of carbohydrates, but that fat, being a more concentrated form of fuel, is equal to 4040 calories per pound.

Each class of articles of the three above named has, therefore, its own distinctive feeding value, and so it is important that, in judging of the suitability of a farm food, the proportion of each constituent should be distinctly stated. All this, however, is on the supposition that they are capable of being properly digested by the animal feeding upon them. Now, it so happens that some carbohydrates are considerably less digestible than others. These indigestible carbohydrates are mostly composed of what we call cellulose, the substance which goes to make up the woody fibre in plants. Thus, when it is stated that a farm food contains a certain percentage of carbohydrates, we naturally go on to ask: What proportion of the carbohydrates is indigestible? In other words, how much of it is woody fibre? Whatever proportion that is, it should be deducted from the total percentage of carbohydrates in a food, if we wish to arrive at a true estimate of such a food's nutritive value. A cake of sawdust may yield a large proportion of carbohydrates, but, as most of this is simply

fibre, its food value is next to nothing. If a registration certificate or an invoice gave simply the percentage of carbohydrates in such a "food", and did not state what proportion thereof was fibre, the purchaser would be egregiously misled.

One of the few regulations exclusively confined to farm foods, No. 13, prohibits the importation or sale of bone products which have not been properly sterilized, and no bone product will be registered as a farm food unless a certificate is furnished to the effect that sterilization has been efficiently performed.

The provisions for the annual inspection of farm foods, for the examination and detention by the Customs of any farm foods imported from oversea, and for the submission of samples by private persons are identical with those applicable to fertilizers, with the exception that the detailed method of sampling whole consignments does not apply to farm foods, nor are any limits of error laid down. In all other respects the regulations for farm foods are similar to those for fertilizers.

SEEDS.

The regulations which bear exclusively upon seeds are very few, and the Act, which includes potatoes under the term "seeds", specially exempts the seller of seed from any obligation to furnish the purchaser with a guarantee of purity and germination. The sale of killed or dyed seeds—generally fraudulent in its inception—is, however, explicitly prohibited by regulation, and any purchaser of seed may, on payment of the fee prescribed by tariff (Regulation No. 36), and on giving due notice to the vendor, as in the case of fertilizers and farm foods (Regulation No. 37), of his intention to have the seed examined, coupled with an offer of division, obtain from the official appointed for that purpose, a certificate of examination.

PEST REMEDIES.

The special provisions on the subject of pest remedies constitute an entirely new feature in the regulations under the Act. The statutory definition of a "pest remedy" is a substance manufactured "for the prevention or destruction of any noxious plant or any parasitic pest of any plant, whether of insect fungoid, or similar nature". Such articles as sheep and cattle dips, which are used against parasites infesting not plants but animals, are therefore outside the scope of the Act, except, of course, when stated on the label to be useful as remedies against plant pests.*

Amongst the regulations of a more general character (Nos. 30 to 41) the following provisions with regard to fertilizers, farm foods, or seeds, apply also to pest remedies as a whole:—

Alteration, either by addition or abstraction, of any pest remedy intended for sale is prohibited (No. 30), and no pest remedy so altered may be sold (No. 31).

Tampering with a pest remedy exposed for sale so as to prevent a fair sample being taken is prohibited (No. 32), and likewise tampering with any sample that has already been taken.

The analyst to whom a sample of any pest remedy is submitted is required to divide the latter into two parts (as in the case of the

* In the case of tobacco dips, for instance.

other articles previously dealt with) retaining one part for later production and analysing the other.

The pest remedies more specifically dealt with in the regulations are bluestone, or sulphate of copper (Regulation No. 24), Paris green (Regulation No. 25), arsenate of lead (Regulation No. 26), sulphur (Regulation No. 27), and tobacco extracts (Regulation No. 28). Inspection of premises where any of these five classes of articles are kept for sale is authorized, and such articles may be taken for analysis, divided into three parts in the manner before described, and submitted to one of the official analysts, who will then further sub-divide it as above mentioned.

The essential provisions of the new regulations defining and limiting the composition of each of the five classes of pest remedies specially referred to are set forth in the following paragraphs:—

BLUESTONE.

Bluestone, blue vitriol, or sulphate of copper may not be sold under any of the names commonly applied to that substance if it does not contain at least 60 per cent. of anhydrous copper sulphate. The value of the article as a fungicide is dependent upon the amount of copper sulphate present, but during many years agriculturists used to complain of the impurity and comparative inefficiency of the article as sold to them. In some samples analysed in the Capetown Laboratory, the amount of copper sulphate was found to be only one-eighth of the proper quantity. As a rule, such impure mixtures, consisting as they do largely of sulphate of iron, are very pale in colour, and therefore readily distinguishable from the brilliant blue of pure crystaline copper sulphate.* The theoretical amount of anhydrous copper sulphate in the pure article is between 64 and 65 per cent., and unless adulterated or exceptionally bad in quality there is no danger of less than 60 per cent. being present in the commercial article. Pure bluestone which has lost some of its moisture may contain even more than the theoretical 65 per cent. of copper sulphate.

PARIS GREEN.

Paris green is known to chemists as Aceto-arsenite of copper, and when quite pure should consist of 82 per cent. of copper arsenite and 18 per cent. of copper acetate, or, to go further back, its ultimate constituents are approximately:—

Copper oxide	31	per cent.
Arsenious oxide	59	,,
Acetic acid	10	,,

In the unavoidable variations of manufacture, often supplemented by carelessness, the percentage of arsenious oxide combined with copper is often considerably lower than the theoretical amount—very much lower, in fact, than the margin of 9 per cent. which the regulations now promulgated allow. Frequently the *total* amount of arsenious oxide in the insecticide may be high, but analysis may show this arsenious oxide to be present in the free condition; in other words, as white arsenic instead of being in combination with the copper as copper arsenite. This arises from the fact that white arsenic being

* This distinction is less easily noted if the article has been powdered. Even the purest bluestone, when powdered, is much lighter in colour than the original crystals, but when it contains much sulphate of iron the large crystals themselves are of a pale colour.

cheaper than copper arsenite, the Paris green is adulterated with arsenic in the cheaper form. Such an adulteration, however, is serious in its effects on the trees, for the added white arsenic is more soluble than the arsenite of copper and makes its presence known by a serious scorching of the foliage. The regulation accordingly limits water-soluble arsenious oxide to not more then 3½ per cent.

The effectiveness of Paris green may be reduced by the addition of some inactive adulterant; for instance, some coloured substance which may somewhat resemble Paris green in appearance, such as a mixture of Prussian blue and chrome yellow; or powders which may add weight and possibly reduce the colour, like lead chromate, calcium sulphate or calcium carbonate.

The regulations recently promulgated provide that Paris green may not be sold under that name unless it contains at least 50 per cent. of arsenious oxide; nor may it be so sold if it contains more water-soluble arsenic than the equivalent of 3½ per cent. of arsenious oxide; nor yet if it has been so mixed or packed as to injure its quality or strength.

LEAD ARSENATE.

As an insecticide for spraying purposes this substance was first brought into use as recently as 1892. Amongst the advantages of its employment, relatively to Paris green are that it is less liable to injure foliage, being less soluble in water. As it contains less arsenic than Paris green, and more of the article has to be used in order to produce the same effect, it is initially the more expensive of the two. However, it remains in suspension in the spraying liquid better than Paris green does, and is therefore capable of more uniform distribution with less effort.

Carelessness in the making of the article may lead to its containing so high a percentage of water-soluble arsenic as to bring about the same kind of scorching of the foliage that was referred to in connection with Paris green. In some instances supposed "lead arsenate" has turned out to be white arsenic: to spray fruit trees with the latter substance would of course mean complete disaster.

It is important that lead arsenate should be kept moist until ready for use, for when it has once been dried it is so difficult to keep the arsenate in suspension in the course of spraying that inequality of application results. For this reason the material is put up in a moist condition, and it is even necessary to leave 40 to 50 per cent. of water in the prepared article, and if the containing receptacles are kept air-tight so as to prevent evaporation it will be found fit for use on opening the sealed cans, any of the arsenate that is left unused being covered with a couple of inches of water to preserve it for the next spraying. The water so added must, however, not be excessive in the case of sealed receptacles, hence the provision regarding mixtures of lead arsenate and water containing over 50 per cent. of the latter.

The regulations now in operation provide that lead arsenate may not contain more than 50 per cent. of water; its total content of arsenic must not be less than the equivalent of 12½ per cent. of arsenic pentoxide; it must not contain more water-soluble arsenic than the equivalent of ¾ per cent. of arsenic pentoxide; nor will its sale be allowed if it is packed or mixed in such a way as to injure it in strength or quality. For practical reasons it is at times desirable as indicated above that a lead arsenate should be mixed with a larger proportion of water than the prescribed 50 per cent. The sale of

an article so mixed with an excess of water will not be interfered with provided the mixture is labelled "Lead Arsenate and Water", with the actual weight of lead arsenate that it would contain if there were only 50 per cent. of water present plainly and correctly stated on the label.

SULPHUR.

All receptacles in which finely divided sulphur is exposed for sale must be clearly and durably marked so as to show whether the receptacle contains ground sulphur, flowers of sulphur, or milk sulphur. The label must also show the minimum degree of fineness of such sulphur by Chancel's test. When sulphur is delivered otherwise than in a receptacle marked as above an invoice conveying the requisite information must be at the same time furnished to the purchaser.

In an article on "Sulphur as a pest remedy" in the *Cape Agricultural Journal* of December, 1908 (Vol. 33, pp. 719 to 730), I dealt exhaustively with the different classes and qualities of sulphur on the market, and to that article I would refer present readers who desire fuller information on the subject. As a rule flower sulphur is finer than ground sulphur, and milk sulphur finer than flower sulphur, but this is not invariably the case, and in my paper above mentioned there are illustrated, side by side, a ground sulphur of 73 degrees fineness by Chancel's sulphurimeter and a flower sulphur of only 43 degrees, the former being not far short of twice as fine as the latter.

The regulation does not deal with the matter of purity. There is scarcely any need. Only in two cases out of several samples of sulphur examined during the period 1897-1908 did the percentage of sulphur fall below 98, and even in those two cases the low percentage (97.28) of one was due to moisture, and that of the other (93.25) to an intentional addition with the object of preventing "clogging".

When used on vines in treatment of oïdium the fine particles of sulphur in order to exert their proper effect, must be in actual contact with all the diseased parts of the vine, and in order that such contact may be most thorough and continuous, it is clear that the sulphur must be in the condition of an exceedingly fine powder. Furthermore, the finer the particles of sulphur the larger surface these particles will expose to the oxidising action of the air, and hence the more fumes they will give off, so that, other things being equal, the more effective will be the action of the sulphur, for it is believed that the beneficial effects of the sulphur particles lies in the power of the fumes, which they give off in moderately warm weather to destroy the mycelium and spores infesting the plant. The finer the sulphur also the more even will be the distribution of which it is capable, and the more closely it will adhere to the leaves. Chancel's sulphurimeter is the appliance used to test the degree of fineness of any particular sample of sulphur. A low degree, such as 20 or 30, indicates a very coarse sulphur. About seventeen years ago sulphurs of greater fineness than 50 degrees were not easily procurable in Capetown. The sulphurs most effective against oïdium are commonly regarded as having a fineness of at least 60 degrees and averaging 67 degrees, but sulphur is sometimes met with as fine as 82 degrees.

NICOTINE PREPARATIONS.

All preparations in which nicotine is the active principle must be contained in sealed cans or air-tight vessels, and must be marked in

such a way as to indicate clearly the minimum percentage of nicotine contained in the extract.

These preparations are invariably tobacco extracts, and the reason for stipulating that air-tight cans be used as the volatility of the active ingredients which may possibly result in a diminution of strength failing such precautions. Nicotine extracts examined in the Cape Laboratories have at times shown very great variations, the maximum being three or four times as great as the minimum. An approach to something like uniformity is therefore clearly desirable, and a definite indication of the minimum percentage will give the purchaser a reliable means of judging the quality of his purchase.

Maize Judging at Agricultural Shows.

By JOSEPH BURTT-DAVY, F.L.S., F.R.G.S., Government Agrostologist and Botanist (Transvaal).

THE awarding and winning of prizes are not the sole *raison d'être* of an agricultural show. Unfortunately, there are people called "pot-hunters" who exhibit solely for the sake of winning prizes, either for their intrinsic value, which is to be condemned, or for the advertisement of their seeds or other products of the farm Such people are apt to injure an agricultural society by discouraging others who have not the same facilities for preparing special exhibits. It is desirable, therefore, that the number of prizes which can be drawn by any one exhibitor in any section be limited. The main object of the agricultural show should be educational; the farmer should be able to learn from the exhibits the need for and means of improving his own crops, where he can obtain good seed, and the relative merits of new breeds. A man is apt not to realize the need for improvement in seed or in methods until he sees that some one else is doing better than he; an agricultural show should be the best place to open the eyes in this respect.

As an American writer on maize has pointed out, a comparison of typical samples of different breeds exhibited at agricultural shows is probably one of the most effective means of obtaining information in regard to the characteristics of any race. This is particularly the case if the exhibits are so arranged that a comparison of samples belonging to different breeds can easily be made.

RULES GOVERNING MAIZE EXHIBITS.

The following rules are based on the experience gained at leading South African Shows:—

1. Each entry must be accompanied by a certificate giving as nearly as possible the date of planting and date of harvesting of the crop and name of the district in which it was grown. These certificates must not be seen by the judges till after the judging.
2. No exhibit may be entered in more than one class.
3. An exhibitor may make only one entry in any one class.
4. An exhibitor is barred from exhibiting in more than three classes in any one of Sections I to III inclusive. This allows each exhibitor to show an early, medium or main-crop, and a late breed in each section. At some American shows an exhibitor may only enter in *three* classes in all.
5. Every exhibitor may enter for all classes in Section IV (special prizes), but may only take two *prizes* in this section; should he obtain more awards he will have the option of choosing which two prizes he will take. All awards will, however, count as points in the aggregate for the Grand Championship.
6. Where there is only one entry in a class a prize shall only be awarded if the judges consider that it is deserving of recognition.
7. In such an event the judges shall decide whether a first, second, or third prize shall be awarded.

8. Grand Championship.—The Grand Championship Cup will be awarded for the highest number of points obtained by any exhibitor. Points will be awarded as follows:—Highly commended, ½ point; third prize, 1 point; second prize, 2 points; first prize, 3 points; championship of first prizes in a section, 4 points extra. The last-named provision is made to prevent mere number of entries from scoring over quality of exhibit. An exhibitor A who makes three entries in each of the Sections I to III inclusive, and who obtains six first prizes, would score 18 points; another exhibitor B who enters in only one class in each of the three sections may obtain the first prize and the championship in each section; unless the championship counted for more than 3 points, B would score no more points than A, although the quality of his exhibit was superior, as evidenced by his taking three championships. The aim of agricultural shows should be to encourage quality rather than number of exhibits from any one exhibitor.

9. In the event of a tie, the judges must decide as to the general relative merits of the two tieing exhibits and award the championship to the one which in their opinion is the best. If taken in an absolutely mathematical sense, the counting of points may result in an injustice being done to the best exhibit. It is obvious that if one exhibit won prizes against severe competition, it is more worthy of a championship than one which had no competition.

10. The exhibits must have been harvested during the twelve months immediately preceding the show.

11. Exhibits must not be treated unfairly by removing poor, crossbred, injured, or otherwise undesirable grains and replacing them by good ones. Any unfair or tricky occurrences bar the exhibitor from all entries and all privileges of the show.

12. But "grooming" of the ears in such a manner as to allow of their best possible presentation is strongly recommended; e.g. shanks of ears should be neatly removed with a pocket knife, and loose silks should be carefully taken off.

13. Exhibits must be delivered to the stewards of the produce section two clear days before the opening of the show. They must be carefully labelled both *inside* and outside of the bag or box, for it often happens that the outside label is torn off in transit, and the ownership (if there are several such cases) is only traced with difficulty. The inside label should bear the name and address of exhibitor, the date of forwarding, and the section and class for which it is entered. It is best to tie this on to at least one of the ears, or inside the mouth of the sack of shelled grain.

14. All exhibits are subject to necessary handling by the judges, but remain the property of the exhibitor, and may be secured by him immediately after the show is declared closed and the awards have been made.

15. No professional maize breeder, seed dealer, or expert judge will be allowed to exhibit except in classes specially arranged for them.

16. A muid of shelled maize shall weigh 203 lb. gross.

17. A bag of ears must be a full muid maize sack, and must weigh not less than 100 lb.

18. An ear of maize is a cob with the grain still attached, but with the husks removed.

19. In classes in which the breed is not specified, each entry must be conspicuously labelled with the name of the breed, or the entry will be disqualified.

THE PRIZE-LIST.

It is important that the growing of recognized standard breeds of maize be encouraged. The offering of prizes for specific named breeds is doing much to permanently improve the maize industry of South Africa.

The custom of allowing one recognized breed to compete with another in the same class (except for a championship) should be discouraged, and should be dropped altogether as soon as possible. Until we have more experience as to the best breeds to grow in the country, and can confine ourselves to giving prizes for them, it will be practically impossible, and certainly undesirable to draw too hard and fast a line in this respect. We have, however, advanced well beyond the stage of giving a prize for "the best bag of white maize", which we can remember having been the sole requirement at some of our shows only a year or two ago. But much improvement has yet to be effected before we can reach a fair state of development in regard to prize-lists.

CLASSIFICATION.

The proper classification of exhibits is essential to the educational value of a show, and to successful judging. In the classification of maize two main points should receive consideration:—

(1) The exhibition of ears selected for seed, by which the would-be buyer can determine by whom and where the best seed maize in his particular district, province, or country is grown. In this section there are usually two sub-sections, (*a*) the ten-ear and (*b*) the single-ear competitions. It is often argued that this section has no value to the practical farmer because "any one can grow ten good ears in his back garden". This, however, is not the case. To produce ten really good exhibition ears from a small plot is almost impossible owing to the much greater danger of imperfect pollination, attacks by insect pests, etc. The ten-ear and single-ear competitions are essentially educational; through them a farmer learns what to select for seed.

(2) The exhibition of the commercial article—the maize grain—by which the merchant and manufacturer are enabled to learn where and by whom are grown the best qualities for their particular classes of trade.

Two distinct score-cards are required for the judging of these sections.

SECTIONS.

The following sections are found suitable for South African shows:—

Section I.—Shelled maize for market or export. One muid (203 lb. gross) of shelled maize, each bag to be accompanied by one full bag (to weigh not less than 100 lb.) of ears from the same crop; these ears to be taken into consideration by the judges in making the awards.

Section II.—Seed maize; ten ears selected for the breeding plot.

Section III.—Best single breeding ear.
Section IV.—Special prizes.

As far as possible, all of these sections should be represented in every prize list in districts where maize is a staple crop.

MODEL PRIZE-LIST.

As the prize-lists for the current season's shows are already published, it is unnecessary to issue a revised model prize-list until next season.

PRINCIPLES OF JUDGING.

Although each province and district specializes in particular breeds of maize, and though the ears produced in each may differ in size, etc., the principles underlying maize judging are the same for all conditions, and these must be clearly understood in order to judge successfully. It is not merely a question as to which is the best exhibit in its class on a particular show, but whether the exhibit compares favourably with a definite standard. This standard should be the one recognized by authorities as embodying all of the qualifications of the best maize. Therefore the judges must be thoroughly familiar with the points on which maize is judged, and with the standards which have been set for each breed. A printed "standard of perfection" is a useful guide; such a standard cannot be final, but will grow or be modified from year to year as the various breeds are improved or altered. A well-arranged score-card is of great assistance in maintaining a judicial balance. But the judge should bear in mind that the score-card may easily be abused if it is used in an absolutely mathematical sense, for there are certain points which cannot be reduced to precise figures, and which will be neglected if the score-card is slavishly followed, and a wrong decision will result. On this account the use of the score-card is sometimes condemned, though it is usually not the score-card, but the judge who uses it, who is at fault. The judgment of the person who is comparing the exhibit must enter into the score, and experience should guide him in marking each point on the card. There are some men who are born judges, and who can intuitively judge by eye without the aid of a score-card; there are a few who even claim to find the score-card a hindrance, because their perception and summarizing of points go together so quickly; but we believe such men are rare.

There are so many points in an exhibit that one may easily place an undue value on those which can be seen at a glance, such as length of ear, uniformity, narrow sulci, good colour, and good tips, to the neglect of such important points as shape and depth of grain, circumference and shape of ear, yield per ear, percentage of grain to cob, and the like. To the average judge of maize, the score-card is of great assistance if used properly, for, although the score-card is a bad master, it is a good servant. But in using it, the judge should bear in mind that there are no absolute rules which can be reduced to writing by which maize samples can be properly judged, independent of that intuitive perception of good and bad points which accompanies experience in a good judge. There are some people who will never make good judges, for judges, like poets, are born, not made.

METHODS OF JUDGING.

The aim in judging seed maize is to determine the best sample for seed purposes by careful comparison with a uniform standard scale of points. It is desirable to keep the separate scores of different exhibits side by side for comparison. It is a good plan to use a printed score-card of uniform size and shape on which the scores of different exhibits in any one class may be entered. In scoring any point it is useful to have the exhibits which have already been judged, laid out side by side so that at any time a comparison of scores already made may be easily and quickly noted. Where there are many entries and the scoring is at all close, it is desirable to refer from time to time to the score previously given for the same point in the other exhibits. Unless this is done, it is difficult for the judge to keep clearly in mind the exact "cut" made on a point in previous cases.

The stewards, judges, and assistants should use care not to injure the ears; they should be handled as little as possible, and should not be broken. If damaged by falling, the loss of grain will affect the percentage of yield.

Good light is essential in order to detect poor colour of grain and cross-bred grains. A convenient table is essential to good judging; it should be of such a height that the judges need not stoop over unduly to examine the ears, and so that they can see both tips and butts without handling the ears.

Ten ears is a useful number, as it facilitates scoring of points and rapid calculation of averages. Rapidity of movement is essential to success in judging a large number of entries; ten minutes should be long enough for any one exhibit of ten ears, except for determination of percentage of grain to cob and total yield of grain. To judge a sample accurately in ten minutes means that all unnecessary moves must be omitted. The eye must be trained to judge accurately at first sight.

After the other points have been determined in any one sample, a competent assistant should follow and shell off and weigh up the ears to determine percentage of grain to cob. For this purpose the five alternate ears of the ten are weighed and shelled, the weight of shelled grain is taken, and the percentage determined.

SEED MAIZE.

The aim in judging seed maize is to determine which is the best sample for seed purposes. The *best* seed maize is that which will produce the heaviest yield of grain of the best quality for feeding or for manufacture; such a type must, therefore, be the most profitable to grow. The competing exhibits are carefully compared with the standard which is recognized as embodying all of the qualifications of the best seed maize. These qualifications include

(1) points which ensure good yield, e.g. size, uniformity, and shape of ears, straightness of rows, well-filled butts and tips, shape of grain, yield of grain per ear, percentage of grain to cob, etc.;

(2) which ensure a perfect "stand" or crop in the field, e.g. uniformity in shape of grain, percentage, and vigour of germination;

(3) which ensure good condition for consumption or export, e.g. maturity, soundness, dryness, etc.;
(4) trueness to type and breed characteristics in shape, colour, etc.;
(5) the value of the sample for feeding or manufacturing purposes as evidenced by the comparative percentage of protein, oil, starch, etc.

Shamel points out that these standards have been developed and arranged by experienced growers, breeders, and judges to such a degree that a sample which comes up to them has been found to be the best yielding, has the best degree of vitality, and is the most profitable seed to grow, and consequently commands the highest price as seed. It is recognized, however, that we do not yet know enough about the correlation of characters to say that our standard is perfect. Much remains to be done in the direction of a thorough scientific study of the maize plant to find out which visible characters are correlated with the invisible characters to which we owe yield and quality. That such visible characters may exist is well known among stock-breeders; an experienced dairyman buying a milch cow looks for one with a long, thin tail, prominent "milk" veins, good udder, and of a certain shape of body. It is not probable that a thin tail has any direct connection with the supply of milk, but experience shows that a thin-tailed cow is usually a better milker than one with a thick, coarse tail. So with plants; there are visible characters which may be correlated with the invisible.

DESIRABLE CHARACTERS OF BREEDING EARS.

A casual glance at an ordinary harvested crop of maize ears conveys but litle idea of the degree of variation among them. It is surprisingly difficult to find ten uniform ears in a heap of many thousands from an ordinary crop. Experience shows that certain characters of the ears are in certain breeds associated ("correlated") with heavy yields. A study of these correlations has led to the framing of score-cards for judging. The following are among the most important characters:—

UNIFORMITY OF EXHIBIT: 5 POINTS.

Uniformity of exhibit refers to uniformity in appearance, shape, size, colour, indentation, smoothness, etc., but it does not refer to the *kind* of shape or colour. The shape and size may be poor, but if the ears are alike they must be given full marks for uniformity; shape and size will be scored under those points. In scoring for uniformity it is best to remove those ears which are distinctly lacking in uniformity with their fellows; the remaining uniform ears are allowed half a point for each.

TRUENESS TO TYPE AND BREED CHARACTERISTICS: 5 POINTS.

In breeding live stock it is universally recognized that it is desirable to keep to a uniform type. The same principle applies to plant breeding, though it is less rigorously applied, because our breeds are less definitely fixed. Stock breeding has been practised on very systematic lines for many generations; plant breeding on definite lines is much younger, and our breeds of maize are constantly improving.

But with the old and established breeds of maize, standards have been set by Breeders' Associations, and it is highly desirable to stick to those standards. Variations occur from time to time with greater or less frequency in all breeds of either animals or plants; these are culled out by the careful breeder. In the case of plants these variations (from whatever cause) may be in the direction of distinct improvement; if so, these may be kept, the individuals producing them may be bred by themselves to fix the improved character, and a new breed, race, or strain may be started. But it is undesirable to start such new races unless their distinctive character is clearly worth having; there is far too great a tendency to name and propagate novelties based on merely trivial characters.

Not only is trueness to type necessary to preserve the characteristics of the breed, but selection to type is necessary in order to produce uniformity; uniformity is essential to the production of the best merchantable article.

In the case of plants of which the breed characteristics are not yet definitely fixed, the grower has no published standard for a guide, and must choose for himself. In a strain or breed which shows variation in visible characters as well as constitution and yield, the breeder must choose the best type and stick to it, for there must be one which is better than the others. In judging maize it is sometimes difficult to define the type characters clearly, and in this experience is the best guide.

SHAPE OF EARS: 5 POINTS.

The shape of the ear affects the yield, quality, and uniformity of the grain. The object is to choose the best shape of ear to produce the largest possible yield of shelled grain, and the best shape of ear to ensure proper maturity under prevailing climatic conditions. It is generally recognized that the cylindrical ear is, on the whole, the best for the production of desirable characters; but some breeds are characterized by a more or less tapering ear, and if tapering is a breed characteristic it should not be treated as a defect, and the exhibit should not be "cut" on that account. If the grower does not like the tapering ear he can discard the breed in favour of one with a more cylindrical ear, or he can attempt to develop from the old one a new breed which will meet his requirements. The objection to a tapering ear is that the grains in the upper portion are usually much smaller than those on the rest of the ear, and an uneven sample is the result. It is sometimes found that two rows run only part way up the ear or in other words "are lost"; this is a defect, as it means loss of grain.

It is difficult to define the varying degree of tapering in different breeds, and here experience rather than written rules must be the judge's guide.

We do not yet know enough about ear shapes to speak authoritatively as to the very best shape for ears to have. Some breeds being grown in South Africa at the present time, e.g. Chester County, show a tendency to flattening or lateral compression of the ear, which sometimes develops into a fasciation of either the whole or the upper portion of the ear, and sometimes to a lobing or division of the apex into fingers. These features are undesirable, and all tendency towards them should be bred out by discarding ears which show a tendency

to flattening at the tip. It is customary to allow half a point for each well-shaped ear in the exhibit.

STRAIGHTNESS OF ROWS: 5 POINTS.

Straightness of rows may be less important than size of ear, shape of ear, and depth of grain, but although it may appear at first sight to be merely "a fancy point" it certainly has a bearing upon the greater or lesser production of grain; if the rows are twisted it is scarcely possible to get the maximum amount of grain on the ear. Moreover, the tendency to twisted rows seems to be cumulative, so that it may develop into complete loss of rows, which certainly tends to a reduction of yield and an unevenness of grain.

At the same time, some otherwise well-bred strains seem to develop a marked tendency towards slight twist in the row, and an exhibit should not be scored too heavily on this account if shape of ear, depth of grain, and other desirable characters are present.

COLOUR OF GRAIN: 5 POINTS.

Yellow grains on a white ear are an indication of crossing, whether the yellowness is dark or paler; this means either

(1) that the crop has been grown too near to a yellow breed; or
(2) that the seed used was not quite pure, containing some yellow grains; or
(3) that grains from a crop of yellow previously grown on the same ground have produced volunteer plants which have caused the crossing.

Such yellow grains will usually be found most plentiful either near the tip or the butt, owing to the fact that the volunteer plants or the neighbouring field of yellows came into flower just before or at the close of the flowering period of the white breed.

The effect of crossing a yellow breed with white pollen is not as clearly marked as in the case of yellow on white; in some cases the whiteness on the yellow is imperceptible, in other cases it shows in the form of a white cap on the yellow grain; but some pure breeds have a normally white-capped grain, e.g. "White-cap dent" and "Bristol 100 day".

For one or two yellow grains on a white ear or white grains on a yellow ear, a "cut" of .25 points is made; for three or four such grains, .5; for five or six, .75; for seven or more, cut one point.

Missing grains are considered as having been crossed, for the judge has no means of telling that they were not removed by the exhibitor to prevent a "cut" for crossing. In practice it is usual to cut .1 of a point for each missing grain.

Richness of colour is a point in favour in yellow maize, but some breeds are naturally paler than others, e.g. Golden King as compared with Yellow Hogan. White grain which is dull in colour may be old or may have been damaged in drying; this also happens where grain has been harvested before it is sufficiently dry.

COLOUR OF COB: 5 POINTS.

White maize should have a white cob. Yellow maize should usually have a red cob. Some breeds of yellow always have white cobs; this is particularly the case with most of the yellow flint breeds and with Golden King, Hawkesbury Champion, Natal Yellow Horse-tooth, German Yellow, and Bishop. A red cob in a white breed or a

white cob in a yellow breed, excepting in the cases noted above, is an indication of careless selection, and every such ear should be "cut" half a point on this score.

MARKET CONDITION: 5 POINTS.

By market condition is meant the best condition for marketing purposes. Condition includes dryness, firmness of grain on the cob, soundness, maturity, and freedom from injury or disease. Maturity is determined by the filling out of the grain; chaffy ends usually indicate lack of maturity. Some breeds naturally have rough ends and a knowledge of breeds is essential to avoid mistakes in this respect. Loose grain usually indicates lack of maturity, but here again knowledge of breeds is necessary, because some of them naturally have a loose grain. By twisting the ear sharply in the hand (but not sufficiently to break it) it is easy to determine whether it is mature or not; if it remains rigid, it is generally ripe and dry, but if it yields to the twist it generally means that the cob is still moist; a cut of half a point (.5) is made for each ear. At those agricultural shows held early in the season it is difficult to obtain thoroughly dry ears, and allowance must be made accordingly.

In the case of seed maize the vitality of the sample is of very great importance; this should be determined by means of a germination test, but such a test takes five days and at an agricultural show there is not time to make it. To determine the viability of a sample of seed maize, three grains should be taken from each ear, one from near the butt, one near the tip, and one near the centre. These will germinate between wet blotting paper or preferably on a plate of pure damp sand; the grains are planted with the point downward and barely covered with the sand. They are planted in such a way that the particular ear from which any set of three was taken can always be determined, so that ears with a poor germination may be discarded. A small plate or saucer or a sheet of glass may be used to cover the germinating grain to check evaporation, and if the test is being made in cold weather it should be carried on in a warm room. Daily examinations should be made and a note taken of the sets which take longest to germinate. A germination of 97 per cent. in five days is usually the standard.

TIPS OF EARS: 5 POINTS.

There should be no projection of bare cob beyond the uppermost grains on the ear; this indicates lack of pollination through irregularity in flowering or other defects. The tip of a well-bred ear should be regularly covered with uniformly sized grains. The percentage of such well covered tips will vary with the season, and in some seasons it may be difficult to find any so covered; but if the scoring is uniform in this particular all exhibitors will be affected alike and no injustice will be done. It is usually found that short ears are better filled than long ones, and other things being equal it is preferable to select a long ear which is not so well covered than uniformly short ears which are well covered. In judging, however, length of ear is dealt with independently and must not affect the scoring for covering of the tips. For every exposed tip one inch long, a cut of .5 may be made, while less is taken off for shorter exposed tips.

In a well covered tip the grains should continue in straight rows right up to the tip, and not be scattered irregularly; for irregular grains the tips should be scored down according to degree of irregularity.

BUTTS OF EARS: 5 POINTS.

To some extent the condition of the butt is a breed characteristic, and in such cases allowance may be made for this fact. With most breeds, however, it is desirable that the rows of grain should be carried well over the butt, leaving a narrow opening through which the shank passes to the cob. If the rows of grains end abruptly on a level with the end of the cob, the ear will not yield as much grain (other things being equal) as if they are well carried over. A *swollen* butt is not a desirable character, for large, poorly filled butts usually have large thick cobs; these dry out slowly, retarding harvesting; in frosty parts of the country this results in the grain being damaged. The shank should be small or medium in size, for large, coarse shanks break off with difficulty and retard harvesting and shelling where the latter is done by hand. But the shank should not be reduced too much or the ear will break off too easily in the wind before the main crop is ready to harvest; with some breeds serious loss has been experienced on this account. Exhibitors should trim out the shanks with a penknife before sending in their exhibits, for if the shanks are left on they detract from the appearance of the exhibit and the judge is apt to mark down accordingly.

Well-filled butts are more frequently met with than well-filled tips. This is because the butt silks appear first and remain in a receptive condition until sufficient pollen falls for fertilization. The tip silks appear last, and it not infrequently happens that all the pollen has shed before they appear. In most South African breeds the pollen is mature some days before the silks.

The following scores are allowed for butts:—

(1) For butts having the grains swelled out around the shank in a regular manner, leaving a concave depression, allow full marks.
(2) Grains swelling out but not in a regular manner: cut .1.
(3) Grains not swelling out beyond cob but regular in size: cut .2.
(4) End of cob covered, but grains flat, shallow, and irregular: cut .3.
(5) For poorly filled butt: cut .5.

Thickness of Cob.—The cob is merely a support for the grains, and the larger the cob—other things being equal—the greater the number of grains that can be carried upon it. A careful study of this point shows that the best yielding ears have thicker cobs than those which give poor yields, or, in other words, that thin cobs generally mean poor yields. But a very thick cob should be avoided, because it requires too long to dry out thoroughly.

UNIFORMITY OF GRAIN: 5 POINTS.

Take two grains from every ear at about one-third of the distance from the butt and place them on the table in front of the ear with the tip of the grain pointing to the ear. The shape of the grain must vary with the breed, and its shape should be true to the characteristic of that breed. Whatever the shape and size of grain in the breed, the grains should be uniform on all parts of the ear, and not only in shape and size but also (in dent breeds) in the character of the dent and smoothness or roughness of the grain tip. Thus on smooth ears all the grains should be smooth and on rough ears all should be rough. Roughness of grain is not objectionable, for as a general rule we find

that a smooth grain is usually shallow, while a more or less rough grain is usually deep; but roughness may be carried too far, and an extremely rough ear is difficult to handle and makes husking a slower and more expensive process.

SHAPE AND LENGTH OF GRAINS: 10 POINTS.

The longer the grain, if in good proportion to width, the greater the yield, but the shape varies with the breed. Breeders classify to some extent according to the shape of the grain, so that we have three groups of breeds, i.e. those with grain broader than deep, those with grain as deep as broad, and those with grain deeper than broad. The marking should be based on the characteristic shape of a particular breed, i.e. do not cut Hickory King because it has not a deep grain, but if we have a Ladysmith with a shallow grain we cut it severely.

Taken all round, the wedge-shaped grain is the best type to breed to, because it necessarily furnishes the greatest amount of grain for the same size of ear.

The shape of the grain is influenced to some extent perhaps by the number of rows, for we find that ears bearing eighteen to twenty-four rows usually have wedge-shaped grain, while those with less than eighteen rows are apt to have broader, rectangular, or round-edged grains. This is not constant, however, for Louisiana 10-row has more or less wedge-shaped grains. The question of the most desirable shape for each breed is largely a matter of experience. In South Africa the types have not yet been definitely fixed. The edges of the wedge should be straight.

The proportion of starch is much higher in a *thick* grain than a thin one, and the proportion of bran and waste much lower, which appeals to the miller and merchant; therefore thick grains are more desirable than thin ones. By thick grains we mean thick in the direction of the main axis of the ear.

The tips of the grain also should be thick, plump, and not sharply pointed. Grain with thin tips has a relatively low oil and protein content, and usually a lower vitality.

In scoring, .5 is allowed for each ear having well-shaped grain.

LENGTH OF EAR: 10 POINTS.

In the case of length of ear especially, standards can at best be but approximate. Change of altitude and latitude affect development so that it is necessary to vary the standard—as regards length of ear of the same breed—as grown in different parts of the world, e.g. America and South Africa, and even in different parts of the same country, e.g. the Transvaal and Natal. 7½ to 8½ inches is the usual length for ears of Hickory King in the United States. We have been able to grow ears of this breed 11½ in. long, and it may be necessary to fix the South African standard higher than that of the States. The difference may be due to crossing and subsequent selection over a period of years. Variation of season also affects length of ear. It will not do, therefore, to take the measurements of a single season as a guide in setting the standard. But variation of season need not affect the use of the standard in judging. In an unfavourable season it may happen that no exhibit comes up to standard length; then all exhibits lose alike on this point, and, after all, length of ear only affects the score by 10 per cent.

Very long ears are usually produced only when the season is long and particularly favourable. Long ears appear to require a relatively long season to develop fully. It is probable that the majority of the longest ears in a crop were produced on late-maturing plants, therefore we may reasonably expect that if in seed selection we pick the very longest ears we may be developing a late-maturing strain. This can probably be counteracted, to some extent, by selecting from among the long ears those that have the most perfect tips.

In measuring ears take the full measurement from extreme butt to tip. This can be done best by the use of the foot-rule held in both hands, one end even with the butt the other end over the tip of the ear. The deficiency and excess of length of each of the ten ears as compared with the standard are added together, and a cut of .5 is made for each inch so obtained.

CIRCUMFERENCE OF EARS: 5 POINTS.

The circumference is taken with a small steel tape at a point about one-third above the butt. Until facility has been attained by practice this is a slow process, but with experience it can be performed rapidly and with ease. At one time it was customary to take two measurements, one at 2 in. from the butt the other at 2 in. from the tip, but this was soon found to take too long and to be unnecessary because the relative taper of the ear is considered under the points for shape of ear. The standard should be approximately as 7½ in. to 10 in. of length, or 8 in. to 12 in. As in the case of length, the excess or deficiency of each ear as compared with the standard are added together, but the cut made for each inch so obtained is only .25.

I have found it best to measure the circumference in centimetres. The average can be converted into inches by the following table:—

TABLE FOR CONVERSION OF CENTIMETRES TO INCHES IN MEASURING CIRCUMFERENCE OF EARS.

Centimetres.	*Inches.*	*Centimetres.*	*Inches.*
11·0	4·32	17·0	6·7
11·5	4·51	17·5	6·9
12·0	4·71	17·78	7·0
12·5	4·92	18·0	7·1
12·7	5·0	18·5	7·3
13·0	5·1	19·0	7·5
13·5	5·3	19·5	7·7
14·0	5·5	20·0	7·88
14·5	5·7	20·32	8·0
15·0	5·9	20·5	8·08
15·24	6·0	21·0	8·26
15·5	6·1	21·5	8·46
16·0	6·3	22·0	8·66
16·5	6·5		

SPACE BETWEEN ROWS: 10 POINTS.

A wide space between rows means waste of space that should be filled by the grains, and therefore means loss of grain. There are two places at which waste space must be looked for—

(1) the *sulci* or spaces between the rows of grain on the surface of the ear;

(2) the space between the tips of the grain, especially noticeable with sharply-pointed grains.

The sulci are generally widest in broad, shallow, and smooth-grained ears, and in those breeds having fewest rows. .75 may be cut

for sulci over 1-16th inch wide; .5 for 1-32nd to 1-16th inch, and no cut for anything less than 1-32nd of an inch. But judgment must be guided by experience in this matter.

The space at the tips can be judged fairly well by the shape of the grain, but in close judging it is well to shell off a space 4 in. long and 4 rows wide, on the five ears that are to be shelled for determination of yield and percentage of grain. By examining the exposed ends and sides of the rows it is easy to determine the degree of loss of space; .25 may be cut for each ear showing too much loss of space.

PERCENTAGE OF GRAIN TO COB: 5 POINTS.

This will depend partly on the maturity of the ears, for ears that are thoroughly dry yield a greater percentage than those that are still wet. To determine this, weigh together the five alternate ears, shell them, and weigh the grain, and calculate the percentage. For every 1 per cent. short of standard cut .5.

WEIGHT OF GRAIN PER EAR: 10 POINTS.

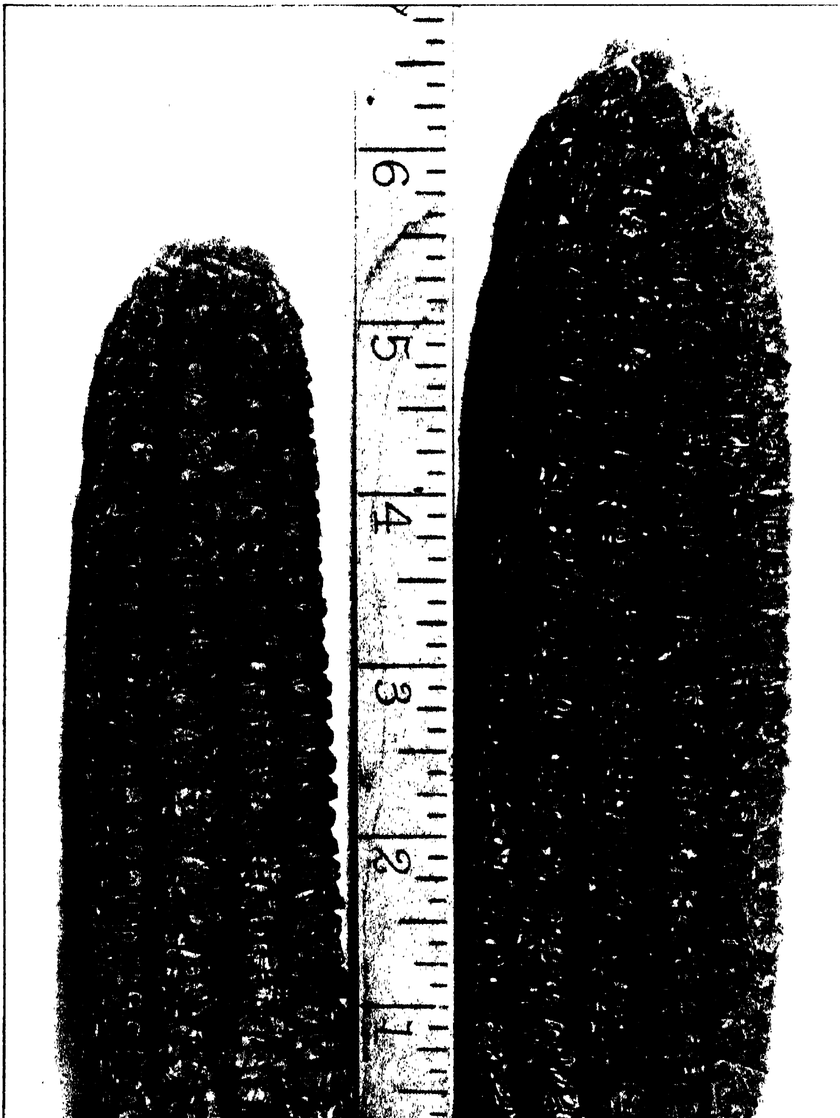
By dividing the total weight of grain (obtained as above) by 5, the average yield per ear is ascertained. For every ¼ ounce of the average below the standard, a cut of 1 point may be made.

STANDARDS OF PERFECTION.

The need for standardization of breeds is recognized among judges; where there are many breeds it is impossible to carry their several measurements in mind without great risk of error. The leading American breeds have been standardized. The word standard, as here used, is not intended to imply finality; probably no one of the recognized breeds is yet perfect or thoroughly established; as improvement takes place the old standards will gradually change. For the newer breeds, standards have yet to be established. The following provisional South African standards are given for the guidance of growers and exhibitors. Weight of ear refers to well-matured ears weighed between July and October.

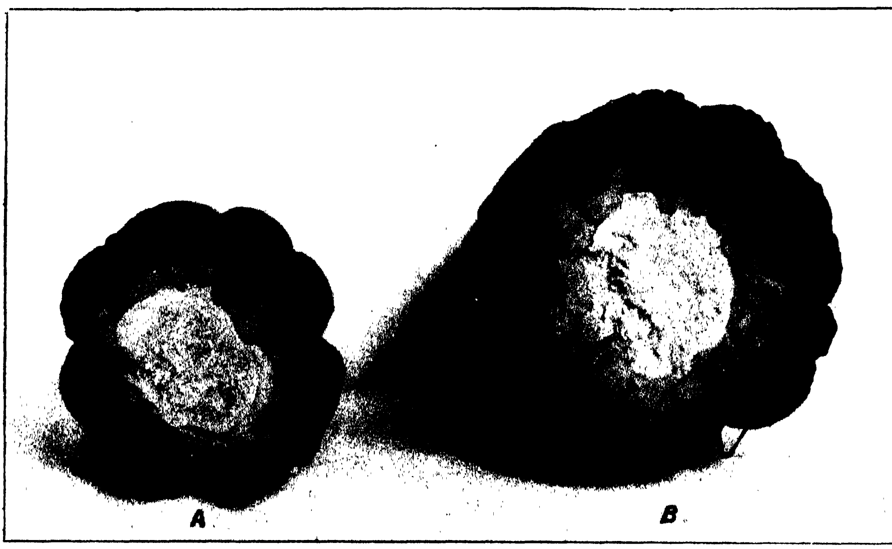
PROVISIONAL STANDARD OF PERFECTION.—DENT BREEDS.

	Hickory King.	Iowa Silvermine.	Boone County.	Natal White Horsetooth.	Ladysmith.
Ear:					
Shape ...	Partly cylindrical	Cylindrical	Cylindrical	Slowly tapering	Slowly tapering
Length ...	9 in.	10 in.	10 in.	11·5 in.	10·5 in.
Circumference	6 in.	7 in.	7·5 in.	8 in.	7·75 in.
Rows	8	14 or 16	16–22	14–18	14–20
Arrangement .	Distinct	Pairs	Pairs	Pairs	Pairs
Sulci	Medium to wide	Narrow	Medium	Medium	Narrow
Butt	Even	Moderately rounded	Moderately rounded, compressed	Even to shallow rounded	Even to shallow rounded
Tip	Regular rows of grain	Regular rows of grain	Regular rows of grain	Regular rows of grain	—
Shank ...	Small	Small	Medium	Very large	Small
Weight ...	11 oz.	17 oz.	17·5 oz.	18·5 oz.	18 oz.
Cob:					
Size	Very small	Small	Medium	Very large	Medium
Colour ...	White	White	White	White	White
Weight ...	1·45 oz.	1·86 oz.	—	3·84 oz.	1·75 oz.



IMPROVEMENT BY BREEDING.

Arcadia Sugar-maize. *A*: best ear produced in 1909–10; *B*: average ear produced in 1910–11. The wrinkled grain is characteristic of Sugar-maize.



IMPROVEMENT BY BREEDING.

Butts of ears shown on previous plate. Note difference in diameter: *B* has 12 rows. *A* has only 8 rows.

PROVISIONAL STANDARD OF PERFECTION.—DENT BREEDS.

	Hickory King.	Iowa Siivermine.	Boone County.	Natal White Horsetooth.	Ladysmith.
Grain:					
Condition ...	Firm upright	Firm upright	Firm upright	Firm upright	Firm upright
Colour ...	Pearl white	Cream white	Cream white	Pearl white	Pearl white
Indentation ...	Smooth to roughish	Very rough	Rough	Smooth	Very rough
Form of dent .	Crease	Pinched	Pinched	Crease	Pinched
Shape ...	Broader than deep	Medium wedge	Medium wedge	Broad and shallow but thick	Deep wedge
Per cent. to ear	87	90	86	78	88
No. per ear ...	400	800 to 1100	1000 to 1100	750	800
Weight per ear	11 oz.	10 oz.	—	12·5 oz.	10·25 oz.
Weight per bushel : lb.	62	64½	—	62	62

PROVISIONAL STANDARD OF PERFECTION.—DENT BREEDS.

	Texas or Hickory Horsetooth.	Louisiana.	Natal Yellow Horsetooth.	Yellow Hogan.	Eureka.
Ear:					
Shape ...	Partly cylindrical	Partly cylindrical	Slowly tapering	Slowly tapering	Slowly tapering
Length ...	8 in.	8·5 in.	9–10 in.	9 in.	10·25 in.
Circumference	6·5 in.	6·5 in.	7 in.	6·5 in.	7·25 in.
Rows	12	10	14	12 14	16–18
Arrangement ..	Pairs	Distinct	Distinct	Pairs	Pairs
Sulci	Medium	Medium	Medium	Medium	Narrow
Butt	Even to shallow rounded	Even	Even, sometimes expanded	Even to shallow rounded, slightly enlarged	Shallow rounded, enlarged
Tip	Regular rows of grains	Regular rows of grains	Regular rows of grains	Regular rows of grains	Regular rows of grains
Shank ...	Medium	Small	Large	Small	Large
Weight ...	12 oz.	13 oz.	14 oz.	11·5 oz.	15·5 oz.
Cob:					
Size	Small	Small	Large	Small	Large
Colour ...	White	White	White	Red	Deep red
Weight ...	—	—	2·25 oz.	1·85 oz.	—
Grain:					
Condition ...	Firm upright	Firm upright	Firm upright	Firm upright	Firm upright
Colour ...	Pearl white	Pearl white	Yellow with light cap	Orange yellow	Deep yellow
Indentation ...	Smooth	Slightly rough	Smooth	Medium smooth or smooth	Medium smooth
Form of dent ..	Crease	Crease	Dimple	Crease	Crease
Shape ...	Medium wedge	Medium wedge	Broad shallow wedge	Medium wedge	Medium wedge
Per cent. to ear	...	—	82	86	—
No. per ear ...	500	450	625	650	900
Weight per ear	—	—	10·75 oz.	9·25 oz.	—
Weight per bushel, lb.	63	56	—	64	62

PROVISIONAL STANDARD OF PERFECTION.—DENT BREEDS.

	Chester County.	Leaming.	Reid's.	Golden King.	Golden Eagle.
Ear:					
Shape ...	Slowly tapering	Tapering	Slowly tapering	Slowly tapering	Slowly tapering
Length ...	10 in.	10 in.	10 in.	8 in.	9 in.
Circumference	6·5 in.	7 in.	7 in.	7 in.	7 in.
Rows... ...	16 or 18	16–24	18–24	10–14	16–20
Arrangement .	Pairs or not	Pairs	Pairs	Distinct	Distinct
Sulci	Narrow	Medium	Narrow	Medium	Medium
Butt	Well rounded	Shallow rounded, compressed, expanded	Deeply rounded, compressed	Even to shallow rounded	Moderately rounded, compressed
Tip	Irregular rows of grains	Irregular rows of grains	Regular rows of grains	Regular rows of grains	Regular rows of grains
Shank ...	Small	Medium	Small	Large	Small
Weight ...	10·5 oz.	13 oz.	12·5 oz.	14 oz.	—
Cob:					
Size	Small	Medium	Medium	Large	Small
Colour ...	Deep red	Deep red	Deep red	White	Deep red
Weight ...	1·54 oz.	—	—	2·4 oz.	
Grain:					
Condition ...	Firm upright	Firm upright	Firm upright	Firm upright	Loose upright
Colour ...	Deep yellow with lighter cap	Deep yellow	Light yellow	Dull yellow	Deep yellow
Indentation ...	Smooth or medium smooth	Rough	Medium smooth	Smooth	Very rough
Form of dent .	Dimple	Crease	Dimple	Dimple	—
Shape ...	Medium wedge	Medium wedge	Long wedge	Broad and shallow	Broad wedge
Per cent. to ear	85·25	—	88	83·25	90
No. per ear ...	1000	1100	900	600	—
Weight per ear	9 oz.	—	—	11·5 oz.	—
Weight per bushel : lb.	63½	66	—	61	—

PROVISIONAL STANDARD OF PERFECTION.—DENT AND FLINT BREEDS.

	Golden Beauty (Dent).	Yellow Cango.	White Cango.	New England 8-row.	Brazilian Flour-Corn.
Ear:					
Shape ...	Slowly tapering	Cylindrical	Tapering	Partly cylindrical	Tapering
Length ...	8·75 in.	9–10 in.	9–10 in.	11 in.	9 in.
Circumference	6·25 in.	5·5 in.	5·5 in.	5·0 in.	6·25 in.
Rows... ...	12	12	12	8	14
Arrangement..	Pairs	Pairs at the butt	Pairs at the butt	Pairs	Distinct
Sulci	Medium	Medium	Medium	Medium	Narrow
Butt	Even	Even depressed	Even, slightly enlarged	Even, usually expanded	Even
Tip	Regular rows of grains	Regular rows of grains	Regular rows of grains	Regular rows of grains	Regular rows of grains
Shank ...	Medium	Small	Large	Large	Medium
Weight ...	13 oz.	11 oz.	8 oz.	10 oz.	9 oz.
Cob:					
Size	Medium	Medium	Medium	Medium	Large
Colour ...	Deep red	White	White	White	White
Weight ...	—	—	—	—	—

PROVISIONAL STANDARD OF PERFECTION.—DENT AND FLINT BREEDS.

	Golden Beauty (Dent).	Yellow Cango.	White Cango.	New England 8-row.	Brazilian Flour-Corn.
Grain:					
Condition ...	Firm upright	Firm upright	Firm upright	Firm upright	Firm upright
Colour ...	Deep yellow paler cap	Orange yellow	Dirty white	Orange yellow	Milk white
Indentation ...	Smooth	Smooth	Smooth	Smooth	Smooth
Form of dent..	Crease	—	—	—	—
Shape ...	Broad wedge, rounded corners	Flat sides, rounded above	Flat sides, rounded above	Flat sides, rounded above	Flat sides, rounded above
Per cent. to ear	—	—		—	—
No. per ear ...	550	600	600	120	680
Weight per ear	—	—	—	—	—
Weight per bushel: lb.	-	67	68	68	62

SOUTH AFRICAN SCORE-CARD FOR SEED MAIZE.

The following score-card has been successfully used by the Department of Agriculture. It has been carefully prepared by comparing the various score-cards in use in the United States. It differs from any one of them in that greater stress is laid on weight of grain per ear than on proportion of grain to cob; it is the yield of grain that we are after, irrespective of the amount of cob.

SCORE-CARD FOR MAIZE.

Show.. Date... .. ..
No. of Exhibit.................... Breed............. ....

STANDARD OF PERFECTION.

Ear: length.........inches: circumference.........inches: yield of grain per ear.........
Kernel: width.........mm.: length.........mm.: shape...............: dent...............

SCORE.	POINTS. Possible.	Awarded.
1. Uniformity of exhibit (indicating careful selection for several generations)	5	
2. Trueness to type or breed characteristics	5	
3. Shape of ears, and straightness of rows. (A cylindrical ear is more likely to be accompanied by uniformity in size and shape of grain than a tapering ear.)	10	
4. Colour of grain (cut for variation in shade or tint)	5	
5. Colour of cob. (A white breed should have a white cob, and a yellow breed a red cob, cut one point for each ear not true to type in this respect. No ear that carries mixed grains should be used for seed.)	5	
6. Market conditions (i.e. soundness of ear and grains, and firmness of grains on cob). Grains should be free from decay, and should be well filled, not shrivelled, nor chaffy ...	5	
7. Tips should be regularly covered with uniform grains so that no part of the cob end can be seen	5	
8. Butts should not be swollen and irregularly covered; rows of grains should extend evenly beyond end of cob round the shank	5	
9. Grain uniformity (in length, shape, and thickness)	5	
10. Grain, shape and length. (The longer the grain, if in good proportion to width, the greater the yield of grain.) ...	10	
11. Length of ears	10	
12. Circumference of ears (this should be approximately as 7½ to 10 inches, or 8 to 12 inches)	5	
13. Space between rows. (A wide space between rows means waste of space that should be filled with grains.)	5	
14. Space between grains at the cob	5	
15. Percentage of grain to cob	5	
16. Weight of grain per ear	10	
TOTAL...	100	

NOTES.

The points on this score-card are explained below:—

SHELLED MAIZE.

The points for consideration in judging shelled maize are those of quality and condition. In a close competition it is impossible to give a just judgment without reference to thoroughly representative ears from the crop.

In the classes for commercial (shelled) maize there has been a good deal of divergence of opinion and practice as to whether tip and butt grains should be included or not, and owing to the loose wording of many prize-lists the decision of the judge has been a matter of bitter controversy; in some cases the best entries have been disqualified on this account.

Unless the prize-list clearly states that tip and butt grains are not to be removed, the exhibitor is entitled to remove them, and should do so. A good judge does not study the tip and butt grains, and it only makes it more difficult to determine the relative merits of the bulk of the grain (which is that from the centre of the cob) if the tips and butts are left in. Nothing is gained by leaving them in, and much precious time is saved if they are removed by the exhibitor; if he does not do so the judge must do it for him, and the judges and stewards have more important work.

If the show committee considers that it is a fairer competition to have the tip and butt grains left in, the case is different; but then the fact should be clearly stated in the prize-list. I fail to see that any advantage is to be gained by this form of competition, and it certainly offers the temptation to the "weaker brethren" to remove at least *some* of their tip and butt grains. It must also be borne in mind that with modern shelling machinery, some of the tip grains can be removed in the process of shelling—is a farmer to be penalized for using such machinery?

Quality.—Quality refers to thickness, shape, size, uniformity, and colour of grain, weight per unit measure, and colour of cob.

Thickness of Grain.—A thick grain contains more starch in proportion to "hull" than a thin one, and is therefore preferred for certain classes of manufacture.

Shape of Grain.—A rather narrow, wedge-shaped grain gives a larger percentage of germ to endosperm than a very broad shallow grain, and for some classes of trade the germ is of more value than the starchy endosperm. But wedge-shaped grains should not have a narrow tip.

Depth of Grain.—A deep grain gives a larger percentage of grain to cob than a shallow one.

Uniformity in thickness, shape, and depth of grain improves the quality; this can be secured by good breeding.

Purity of Colour.—White grain must be 98 per cent. white and yellow grain 95 per cent. yellow; all else is classed as "mixed".

Shade.—White grain should be pure white, free from black tips and brown blotches; cut for brownish tinge acquired in sun-drying. Yellow grain should be clear, deep yellow, and uniform in colour.

Colour of Cob.—White grain should not have red tips, which spoil the colour for certain manufacturing purposes; yellow grain should have red tips except in Golden King, Austin's Colossal, Bishop

or German Yellow, Natal Yellow Horsetooth, and many of the yellow flint breeds.

Weight per Unit Measure.—This is usually given in standard bushels. The American Standard in most States is 56 lb. of shelled grain. Although we do not sell by measure in South Africa, it is desirable to take the weights per unit of measure, as samples vary greatly; the weight gives some indication of quality and chemical composition, for the richer the grain in protein the heavier it usually is.

Composition.—The character of the endosperm can be determined to some extent by holding the grain to the light and by cutting it longitudinally parallel with the broad axis. Inasmuch as most of the oil-content of the maize grain occurs in the germ a large germ usually indicates a high oil-content.

Condition of grain refers to soundness, plumpness, sweetness, dryness, cleanness, and brightness.

Soundness.—Sound grain is free from decay, or the ravages of insects and *Diplodia* injury.

Plumpness.—Plump grain is well filled, not shrivelled nor chaffy.

Sweetness.—Sweet grain is free from mustiness or other objectionable smell.

Dryness.—Dry grain should not (on the high veld) contain more than 9 to 12 per cent. moisture. A parcel containing not more than 12 per cent. will travel safely from South Africa to Europe.

Cleanness.—This refers to freedom from bits of cob, chaff, and all extraneous matter.

Brightness.—A prime choice parcel of maize should be bright and shiny. Some breeds, e.g. Golden King, lack the lustre of others. Grain which has been harvested wet, and then dried out, often loses its brightness, and a dull sample (from whatever cause) is assumed to be due to harvesting when wet.

Soundness and plumpness are considered the primary points in studying condition; sweetness comes third, dryness fourth—for a sweet sample, but not quite dry, may dry out, but a dry sample that is musty will never get quite sweet again. Freedom from dirt, etc., may be considered last.

Maize to be in Prime Choice condition should be thoroughly sound, plump, dry, sweet, and clean. In the best American grading this would be classed as No. 1.

If the grain were dry, sweet, and reasonably clean, but not sufficiently sound or plump for No. 1, it would be classed No. 2.

If only reasonably dry, and reasonably clean, but not sufficiently sound and dry for No. 2, it would be classed as No. 3.

If damp, musty, dirty, or of poor quality, it would be graded as No. 4.

EARS ACCOMPANYING SHELLED GRAIN.

Twenty-five points may be reserved for the ears accompanying a sample of shelled maize. The points to be considered in this connection are those which particularly affect uniformity and the quality of the grain, i.e. trueness to type, shape, space between rows, straightness of rows, and regularity of grain, and firmness of grain on the cob.

Trueness to Type.—Unless the ears are true to type the sample will not be uniform.

Shape of Ears.—The more cylindrical the ear the more uniform the grain. Allowance must be made for breed characteristics in this respect, for the ears of Leaming, Chester County, and some other breeds are naturally tapering.

Space between Rows.—Wide space between rows is space wasted, and usually implies badly shaped grain.

Straightness of Rows and Regularity of Grain.—Unless the rows are straight and the grain is regular in the rows it will not be uniform.

Firmness of Grain on the Cob.—If the grain is loose on the cob it may mean that it is not as plump and well-filled as possible. Observation of this point is the quickest and surest way to detect this defect. But the point is comparative only, for in some breeds the grain is always more or less loose; as far as I am aware, however, this does not apply to breeds grown in South Africa.

SCORE-CARD FOR SHELLED GRAIN.

The following score-card may be used in judging shelled grain:—

	POINTS.
Condition of Grain—	
1. Soundness (freedom from decay)...	5
2. Plumpness (grain should be well filled, not shrivelled nor chaffy	5
3. Sweetness	5
4. Dryness	5
5. Cleanness	5
6. Brightness	5
Quality of Grain—	
7. Thickness	5
8. Shape	5
9. Depth	5
10. Uniformity in length, shape, and thickness ...	5
11. Purity of colour	5
12. Shade and uniformity of colour	5
13. Colour of cob	5
14. Weight per unit of measure	5
15. Chemical composition	5
Ears accompanying Shelled Maize—	
16. Trueness to type	5
17. Shape	5
18. Space between rows	5
19. Straightness of rows and regularity of grain ...	5
20. Firmness of kernels on the cob	5
	100

USEFUL FORM OF JUDGES' CARD.

It is a great convenience to the judge, and is conducive to greater accuracy in the granting of awards, if a convenient form of judge's card is used. The variety of judge's cards and notebooks is infinite, and includes plain notebooks, printed triplicating books, and printed cards. For convenience and rapidity of handling I prefer the card of which a facsimile (reduced in size) is given below. The actual measurements of the card are 10 × 6 inches.

Section	.... AGRICULTURAL SOCIETY.	Class No.

JUDGES' CARD.

Judges' Names ....
Class No.

No. of Entries in this Class..........................

Entry No..........................	Entry No..........................
" "	" " ....
" "	" " ....
" "	" " ....
" "	" " ....
" "	" " ....
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" "	" " ....
" "	" " ....

JUDGES' REMARKS.

AWARDS.
1st Prize No.........................
2nd Prize No.........................
3rd Prize No. ....
H. Commended No................
Commended No...................
Champion ....

.... } Judges.
....

.... } Stewards.
....

Time Judged.............................
Date.......................................

CLASSES.

The following is a suggested list of classes suitable for maize shows. It is usually only the central shows which are able to offer such a complete list as is here given; very few district shows would require to include all of the classes, for only a few of the breeds named are grown in any one district.

SECTION I.—SEED MAIZE: 10 EARS SELECTED FOR THE BREEDING PLOT.

Entrance fee, 5s. per class.

Prizes (in each class): 1st, £2; 2nd, £1; 3rd, 10s.· Championship (of all classes in this section), £3.

Dent Breeds (white).

Class.

1. **Hickory King (8-row).**
2. **Louisiana 10-row.**
3. **Texas 12-row or " Hickory Horsetooth ".**
4. **Salisbury White.**
5. **Iowa Silver Mine or Champion White Pearl.**
6. **Boone County.**

Class.

7. Virginia Horsetooth or Ladysmith.
8. Natal White Horsetooth.
9. Any other white dent breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Dent Breeds (yellow).

10. Eureka.
11. Yellow Hogan.
12. Chester County.
13. Reid's.
14. Natal Yellow Horsetooth.
15. German Yellow or "Bishop".
16. Golden Beauty.
17. Leaming.
18. Bristol 100-day.
19. Golden Eagle.
20. Any other yellow dent breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Flint Breeds (white).

21. Any white flint breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Flint Breeds (yellow).

22. Yellow Cango.
23. Yellow Botman.
24. New England 8-row.
25. Will's Gehu.
26. Any other yellow flint breed. (In this class entries *must* be labelled with the name of the breed or the exhibit will be disqualified.)

Flour-corn or Bread-mealies.

27. South African Bread-mealie.
28. Brazilian Flour-corn.

Sugar-maize.

29. Any breed of sugar-maize. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Pop-corn.

30. Any breed of pop-corn. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

SECTION II.—BEST SINGLE BREEDING EAR.

Entrance fee, 2s. 6d. per class.

Prizes (in each class): 1st, £1; 2nd, 10s.; 3rd, 5s.; Champion Ear (the best ear of all the first prize ears), £2.

Dent Breeds (white).

Class.

31. Hickory King (8-row).
32. Louisiana 10-row.
33. Texas 12-row or "Hickory Horsetooth".
34. Salisbury white.
35. Iowa Silver Mine or Champion White Pearl.
36. Boone County.
37. Virginia Horsetooth or Ladysmith.
38. Natal White Horsetooth.
39. Any other white dent breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Dent Breeds (yellow).

40. Eureka.
41. Yellow Hogan.
42. Chester County.
43. Reid's.
44. Natal Yellow Horsetooth.
45. German Yellow or "Bishop".
46. Golden Beauty.
47. Leaming.
48. Bristol 100-day.
49. Golden Eagle.
50. Any other yellow dent breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Flint Breeds (white).

51. Any white flint breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)
52. Yellow Cango.
53. Yellow Botman.
54. New England 8-row.
55. Wills' Gehu.
56. Any other yellow flint breed. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Flour-corn or Bread-mealies.

57. South African Bread-mealie.
58. Brazilian Flour-corn.

Sugar-maize.

59. Any breed of sugar-maize. (In this class entries must be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

Pop-corn.

Class.

60. Any breed of Pop-corn. (In this class entries *must* be conspicuously labelled with the name of the breed, or the exhibit will be disqualified.)

SECTION III.—SHELLED MAIZE FOR MARKET OR EXPORT.

One muid (203 lb. gross) of shelled maize; each entry must include one full bag (to weigh not less than 100 lb.) of ears from the same crop. These ears will be considered in judging the sample.

Entrance fee, 5s. per class.

Prizes (in each class): 1st, £3; 2nd, £2; 3rd, £1; championship (of all classes in this section), £5.

White "Flat".

Class.

61. Hickory King.
62. Natal White Horsetooth.
63. Ladysmith, Iowa Silver-mine or any other white dent breed.
64. White Cango or any other flat white flint breed.

Yellow "Flat".

65. Any flat yellow dent breed.
66. Any flat yellow flint breed.

White "Round".

67. Any round white breed.

Yellow "Round".

68. Any round yellow breed.

SECTION IV.—SPECIAL PRIZES.

Entrance fee, 20s.

Every exhibitor will be allowed to enter for all classes in this section, but may only take two prizes; should he obtain more awards in this section, he will have the option of choosing which two prizes he will take. All awards will, however, count as points in the aggregate for the Grand Championship.

Class.

69. Five muids of shelled "Choice White Flat" maize, suitable for export (any breed), with five bags of ears of seed-maize of the same breed.

Each entry *must* be accompanied by a certificate signed in the presence of the Field Cornet or the Resident Justice of the Peace, stating that the exhibitor has produced at least 500 muids of the same breed of maize on dry lands, during the past season, and that this particular exhibit was grown without irrigation.

First prize	£10
Second prize	£5
Third prize	£3

Class.

70. Five muids of shelled "Choice Yellow Flat" maize, suitable for export (any breed), with five bags of ears of seed-maize of the same breed, each bag to weigh not less than 100 lb.

Each entry *must* be accompanied by a certificate signed in the presence of the Field Cornet or the Resident Justice of the Peace, stating that the exhibitor has produced at least 500 muids of the same breed of maize on dry lands, during the past season, and that this particular exhibit was grown without irrigation.

First prize	£10
Second prize	£5
Third prize	£3

71. Five muids "Choice Yellow Round" maize, suitable for export (any breed), with five bags of ears of seed-maize of the same breed, each bag to weigh not less than 100 lb.

Each entry *must* be accompanied by a certificate signed in the presence of the Field Cornet or the Resident Justice of the Peace, stating that the exhibitor has produced at least 500 muids of the same breed of maize on dry lands, during the past season, and that this particular exhibit was grown without irrigation.

First prize	£10
Second prize	£5
Third prize	£3

72. Five bags of ears of Hickory King seed-maize (grain on the cob). Each bag to weigh not less than 100 lb.

First prize	£10
Second prize	£5
Third prize	£3

73. Five bags of white seed-maize on the cob, of any one breed (except Hickory King). Each bag to weigh not less than 100 lb.

First prize	£15
Second prize	£10
Third prize	£5

74. Five bags of yellow seed-maize on the cob, of any one breed. Each bag to weigh not less than 100 lb.

First prize	£15
Second prize	£10
Third prize	£5

The Maize-Stalk Borer.

By CLAUDE FULLER, F.E.S., Government Entomologist, Natal.

The Migratory Habits of the Larvae.—In the final issue of the *Cape Agricultural Journal* Mr. Mally, Eastern Province Entomologist (Cape), records an observation upon the migration of a portion of the brood of the maize-stalk borer, some of the young travelling to the upper parts of the host plant immediately after hatching. Mr. Mally suggests that should this prove to be a regular habit under field conditions, it indicates the possible success of the application of insecticides to the growing maize plant. For my part I am inclined to accept Mr. Mally's discovery as the explanation of the oft-reported success of such treatment in Natal, and for the general and growing practice of following this old Boer method throughout the Province. I might say that almost every day of late I have received assurances from farmers that pouring arsenical or contact poisons into the "cups" of the young maize is giving most successful results.

To obtain all the good results claimed for this method of dealing with the pest there must, however, be some considerable movement of the young about infested plants and later migrations. Whilst never having had any idea of the habit of the very youthful caterpillars noticed by Mr. Mally, I have observed much circumstantial evidence of later migration. In my experience this usually follows on more or less artificial field conditions such as "hoeing out", by which process many grub-infested plants are left lying in the field. A reference to this was made in my first and second reports, 1901-1902.

I found later that if feeding larvae are extracted from the stems and placed upon the ground among young growing maize plants, they will ultimately gain an access to those plants. At first they wander about aimlessly enough, hiding in soil crevices, but it is not long before they display a decided inclination to climb the plants; and, though they may fall down several times, behaving as if they have not much idea what they are about, they will in the long run get upon a leaf and then turn downwards, travelling to its base, and there enter the plant.

During the summer I have had some evidence of migration in respect to quarter-grown and half-grown larvae. Although the conditions were partially exceptional, they were not so truly unusual as to make the migration absolutely necessary, though it might still be described as forced, rather than voluntary, as the caterpillars undoubtedly responded to some mental impulse, or perhaps, as one should rather say, some instinct impression.

The circumstances of the two cases were as follows:—First, on the 31st of December, 1910, I received from Mr. T. Mackenzie, of Cramond, a parcel of young maize plants which had been cut off near the base. These were all badly infested with "top-grub". The plants were wrapped up very securely in several folds of stout brown paper. It so happened that the parcel was placed upon a table in my own room, and was under my eyes frequently until the next morning, when I found that as many as twenty larvae had not only deserted the plants but had eaten through the brown paper and were diligently exploring my writing materials and notes.

I immediately concluded that the maize plants had become much heated and that this was the cause of the hurried departure of the caterpillars from the confines of the parcel. I at once opened it up, only to find that the plants were still cool and fresh. Great numbers of caterpillars were found crawling on the inside of the paper, and many were shaken out of the plants. With a view to ascertaining whether all the grubs had been disturbed I spent two hours examining the plants, and found that whilst the majority of the smaller caterpillars had left the plants the greater number of the larger ones remained *in situ*; and, further, that the grubs located in the centre of plants, where fermentation and decay had been present for days, were still rioting in the filth they had produced

Second: A week later I received another parcel from the same source similarly packed. This parcel, I believe, reached me and was opened up within three or four hours of being packed. There was then no evidence of migration, and the plants were placed with the cut ends in a large basin of water—their tops leaning against the side of a breeding-cage. Before the close of the day no less than twelve caterpillars had drowned themselves in leaving the plants. This was an average of one per plant, and is perhaps incorrect, as no precaution was taken to prevent the escape of any which climbed upwards or fell free of the water. Here there was little reason for the migration, and the fact that it did occur only adds greater weight to the first case.

Attack on Sugar-cane.—Some months ago when in Pretoria Mr. Mally showed me an over-wintered caterpillar which he had just secured in some sugar-cane growing at Skinners Court, one of the departmental gardens, near the town. At that time I assured Mr. Mally that I had never received any complaints of grub-attack of this nature from the cane planters of Natal. When I returned I made a number of personal inquiries, which all went to confirm the impression that the maize-stalk borer did not attack sugar-cane. These were barely concluded when the report reached me that the "top-grub" was doing considerable damage to young "plant-cane" in Zululand where snatch crops of maize had been planted in the cane fields. This, upon investigation, proved to be correct, but the circumstance is an exceptional one. The opinion of those planters to whom I referred the matter was that the planting had been done at the wrong season. It therefore occurs to me that perhaps in times not long gone by "top-grub" attack upon sugar-cane was attributed to seasonal influence; and, just as maize sowing is delayed to circumvent its attack, it has since become a recognized practice to postpone cane planting because of the same insect. That the maize-stalk borer does readily attack sugar-cane has been recently brought to my notice by the degree of infestation in some up-country cane plots. For some years past up-country farmers have been planting small paddocks of cane for stock-food, and in some instances these have become invaded by the grub, where it finds an almost permanent breeding-place. Such a state of affairs would suggest the sugar-cane as the host of the grub, but in that case it would be rife in the cane belt, which so far is certainly not the case.

NOTE.

After the foregoing was in type Mr. Claude Fuller forwarded the following extract from a letter received by him from Mr. T. Mackenzie, under date 16th February:—

"With reference to our conversation of yesterday about the grubs in mealies I will give you my recent experience. During the last week

of December, 1910, I found the grub very bad in my twenty-five acre mealie field, planted after the second week in November. Seeing the grub was too far advanced to carry out any means of destroying it I replanted the field between the old rows, which were left standing. I waited until the second week in January to make sure that the first planted mealies were beyond recovery. Then I started cutting them and feeding them to the cattle. In this way I disposed of between five and six acres. I then put a disk harrow on to the rest of the field and tried to bury the older plants. Imagine my disgust when a week later I found the grubs leaving the old mealie stalks and going for the young plants. Of course the grubs being so large and the mealie plants so small, they did a considerable amount of damage, and so I had to go over my work again collecting all the old stalks and carrying them out of the field, besides pulling out all the young ones attacked. The part of the field where I had to cut the stalks for the cattle was quite free of grub, as apparently the grub was taken away in the stalks."

Notes on Crops.

By JOSEPH BURTT-DAVY, F.L.S., Government Agrostologist and Botanist (Transvaal).

SOYBEANS (*Glycine hispida*).

AMONG the variety tests of Soybeans at Skinners Court one of the first to ripen has been the Sakura breed. It was grown in a poor, thin, gravelly red clay-loam as a rotation crop with maize. The seed was sown 5th October, 1910, and the crop harvested 20th January, 1911. Germination was only medium, and the crop harvested was in consequence poor, only 28 lb. being harvested from one-twentieth of an acre, or 560 lb. per acre. This must not be taken as an indication of the general yield of soybeans, however, for other breeds and strains are doing much better. The plants averaged only 18 in. in height. The number of pods borne on a single plant varied from seventy-one to seventeen, and the average number from ten plants was thirty-six, while from one hundred plants it was thirty-four. The average number of beans borne on a plant was sixty-two. The weight of seed from ten plants was ¼ lb., and from one hundred plants 2¼ lb.

The Southern Soybean, again, gave the best germination and made the best growth; and though decidedly later in maturing it promises to ripen in ample time. The annexed plates show the relative size of Sakura and Southern, the Sakura being the shorter plants on the right-hand side of the plot. The second photo shows a plot of Southern. Photographs are also shown of the Sakura in fruit and of the leaves and flowers of the Southern.

NOTE ON NATAL SUGAR BEANS.

An experimental plot of Natal Sugar Beans, planted in Pretoria, yielded the following results:—

1.	32	pods	=	79	beans.
2.	12	,,	=	31	,,
3.	10	,,	=	27	,,
4.	18	,,	=	33	,,
5.	23	,,	=	53	,,
6.	10	,,	=	24	,,
7.	20	,,	=	45	,,
8.	30	,,	=	66	,,
9.	18	,,	=	48	,,
10.	28	,,	=	65	,,
	201	pods	=	471	beans.

Average—20 pods = 47 beans = 2.35 per pod.
Maximum—20 pods = 79 beans.
Minimum—10 pods = 24 beans.

Height about 12 in.; two to four seeds per pod, rarely five or one.

The beans were planted 27th September, and harvested 21st January = 116 days, but have been ripe fully a month; say 91 days or three months.

Colour cream, streaked and mottled with red. A few pods on most plants bore red seeds. By the end of February the crop had been destroyed by weevils.

TEFF GRASS (*Eragrostis abyssinica*).

The season has been unfavourable for the production of teff hay in the drier parts of the country, but some good crops will be reaped on those parts of the Transvaal high veld enjoying fair rains. At the Botanical Experiment Station, Skinners Court, the teff hay crop has been poor. A record of the amount of seed produced shows a return of 393 lb. from three-fifths of an acre, or 655 lb. per acre. A tremendous amount of seed changed hands last year at 6d. per lb. on the farm. At this price 655 lb. would bring £16. 7s. 6d. per acre; not a bad return for a dry-land crop. Teff hay has been known to yield from 1 to 2½ tons per acre, according to season. Last year well-cured teff hay brought from £5 to £6. 10s. per ton in Johannesburg. These prices have naturally caused a tremendous increase in acreage, and every available lot of seed was bought up, some people even paying 2s. 6d. per lb. at the end of last season. Though the yield is not likely to be so good this year, it is to be expected that prices will be lowered appreciably owing to the larger production.

LINSEED (*Linum usitatissimum*).

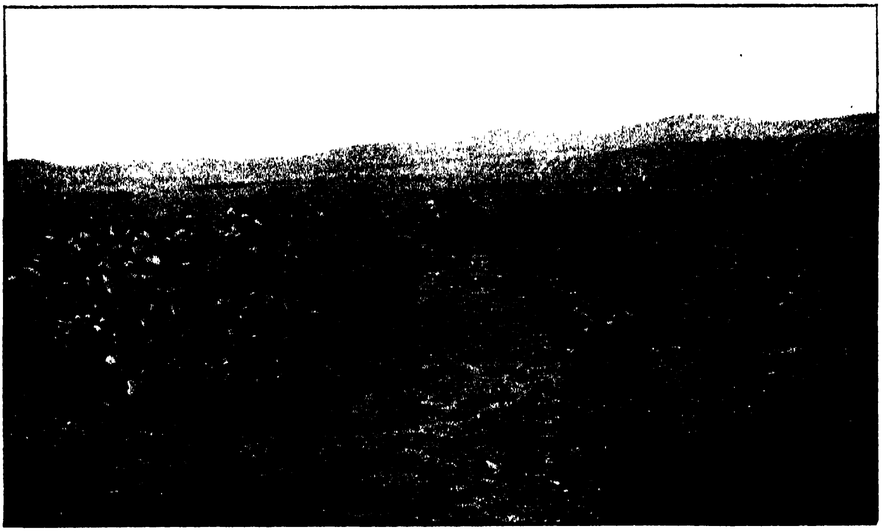
Some headway is at last being made with the production of linseed on the high veld, good crops being reported from Standerton and Balfour. Producers are now inquiring about a market for linseed, and I should be glad of information which would enable me to put them in touch with consumers.

THE KALABAS-PATAAT OR MARANKO.

We are indebted to Mr. E. P. A. Meintjes, of Pretoria, for the specimen of this interesting vegetable illustrated herewith. The exact identification of the plant must remain over for another season, as we have not seen flowers or leaves, but it appears to be a form of the Calabash gourd (*Lagenaria vulgaris*), which is now cultivated in nearly all warm countries, either for the sake of the hard shell of the fruit which is used for drinking cups, water-jugs, and many domestic utensils, or as a vegetable eaten in the same way as summer squash or vegetable marrow. *Lagenaria vulgaris* is a native of Tropical Africa and Tropical Asia.

The specimen photographed was cooked and eaten as a vegetable marrow, and proved to have a very distinctive and agreeable flavour. The colour of this particular variety is light green; another variety grown by Mr. Meintjes is a very dark green, almost black, and shorter and more pear-shaped, and with more pronounced warts.

(*See Article.*) *Plate I.*



SOY BEANS

Showing the relative size of Sakura and Southern varieties. Plants of the Sakura variety are seen on the right-hand side of the plot.

SOY BEANS

A Plot of Southern Soy Beans

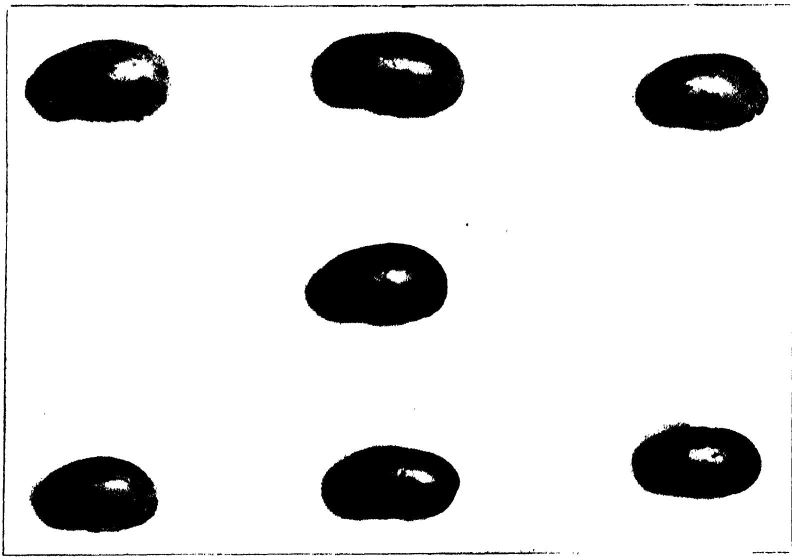
(*See Article.*) *Plate II.*

SOY BEANS.

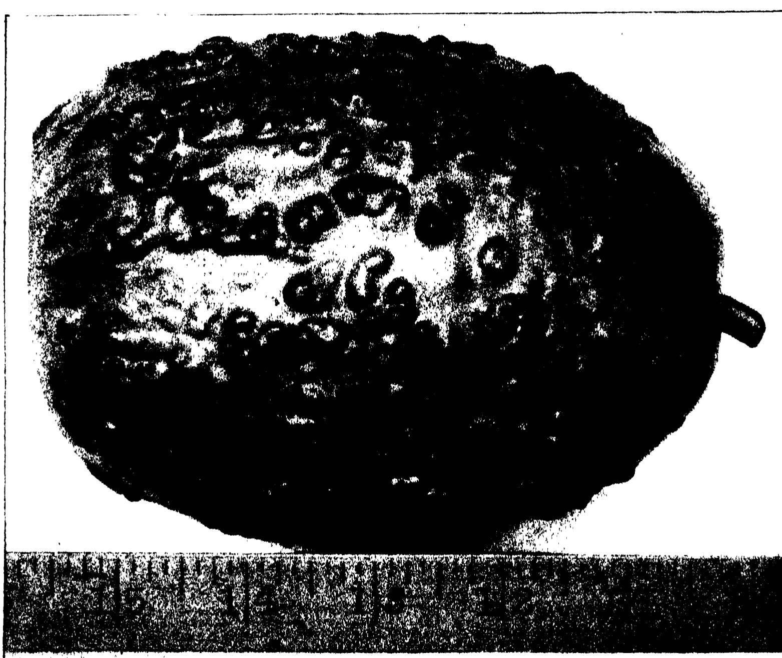
A Sakura Plant in Fruit.

(*See Article.*) *Plate III.*

SOY BEANS.
Leaves and Flowers of Plant of the Sakura Variety



SUGAR BEANS.
Showing variation in size and marking. The red bean in the centre is from a pod of the same plant which produced the others.



A NATIVE VEGETABLE: THE MARANKO (*Kalabas pataat*).
Grown by Mr. E. P. A. Meintjes, Pretoria, who says it is an excellent table vegetable, the flavour excelling that of the ordinary marrow.

Agricultural Statistics—Transvaal.

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	No. of bona fide Farmers.	Total No. of Cows.		Total No. of Heifers under two years.		Total No. of Bulls.		Total No. of Oxen.		Total No. of Cattle.		
	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.
Barberton ...	155	1,308	1,906	733	962	145	165	1,189	1,999	3,375	5,238	5,032
Bethal	858	5,051	9,994	2,787	4,476	436	527	7,038	12,929	15,312	25,685	27,926
Bloemhof... ...	758	7,360	10,039	4,847	5,808	502	507	7,046	11,386	19,755	26,020	27,740
Carolina	320	2,896	5,099	1,951	2,066	254	295	3,069	5,548	8,170	12,180	13,008
Ermelo	743	9,363	16,432	7,709	8,068	792	859	12,750	18,855	30,613	40,591	44,214
Heidelberg ...	1,607	13,054	17,477	5,742	6,886	694	728	13,545	23,496	33,035	41,765	48,587
Krugersdorp ...	1,062	3,705	5,735	2,562	2,947	270	302	7,149	9,634	13,686	16,835	18,618
Lichtenburg ...	1,358	7,827	13,697	3,800	5,270	542	694	11,981	18,216	24,150	29,978	37,877
Lydenburg ...	874	5,916	9,930	3,651	4,902	488	611	7,672	12,421	17,727	22,326	27,864
Marico	1,296	5,161	6,182	2,763	3,165	638	377	4,091	7,283	12,653	15,640	17,007
Middelburg ...	1,393	7,063	13,830	4,112	5,613	716	689	9,371	16,058	21,262	33,933	36,190
Piet Retief ...	287	1,741	2,546	1,101	1,778	284	419	1,688	3,350	4,814	6,235	8,093
Potchefstroom ...	2,350	16,480	28,711	12,207	11,254	1,126	1,233	22,902	36,405	52,715	71,634	77,603
Pretoria	2,159	9,650	21,241	6,984	10,796	901	1,033	14,241	22,057	31,776	43,558	55,127
Rustenburg ...	2,418	7,260	14,760	5,966	8,151	724	774	9,002	16,189	22,952	33,985	39,874
Standerton ...	1,166	8,656	13,776	5,550	6,313	685	770	11,611	17,216	26,502	34,728	38,075
Wakkerstroom ...	695	9,273	12,243	7,027	5,767	585	609	8,822	12,777	25,707	28,117	31,396
Waterberg ...	979	8,190	12,515	4,019	4,767	683	750	6,110	11,172	19,002	26,886	29,204
Witwatersrand ...	390	8,688	9,844	3,749	3,717	447	323	6,960	8,436	19,844	26,619	22,320
Wolmaransstad ...	800	4,543	8,325	5,793	5,841	516	594	5,908	9,651	16,760	20,862	24,411
Zoutpansberg ...	1,141	5,354	9,087	2,802	3,843	766	885	3,750	5,905	12,672	18,443	19,720
Total for Whites...	22,809	148,539	243,369	95,855	112,390	12,193	13,114	175,895	280,983	432,482	581,258	649,886
Total for Natives	—	—	—	—	-	—	—	—	—	—	318,415	339,132
GRAND TOTAL ...	—	—	—	—	—	—	—	—	—	—	899,673	989,018

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COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Butter produced in lb.		Cheese produced in lb.	Cattle died from disease.	Cattle killed for cons'ption.	Total No. Brood Mares.	Total No. Stallions.	Total No. of Horses.			Total No. of Horses died of Disease.	
	Dec. 31, 1908.	June 30, 1910.	June 30, 1910.	June 30, 1910.	June 30, 1910.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.
Barberton	6,751	7,042	—	430	527	41	17	186	209	204	38	21
Bethal	33,014	62,298	25	456	386	1,159	111	2,148	2,537	2,756	33	71
Bloemhof... ...	227,259	151,705	—	1,030	369	1,036	104	2,124	2,043	2,201	33	82
Carolina	41,008	48,061	205	461	231	596	79	1,542	1,376	1,425	42	60
Ermelo	64,419	128,128	1,330	740	656	3,231	333	6,137	6,707	6,789	150	143
Heidelberg ...	47,124	51,121	1,210	659	1,153	1,115	76	3,000	3,308	3,359	56	50
Krugersdorp ...	50,434	65,853	—	585	3,930	30	26	596	546	612	39	28
Lichtenburg ...	261,947	228,154	—	817	953	476	100	1,330	1,333	1,499	21	45
Lydenburg ...	33,598	53,819	—	502	944	782	82	1,692	1,683	2,025	48	76
Marico	63,318	34,169	—	1,358	827	111	51	595	578	654	62	27
Middelburg ...	57,921	50,959	30	710	1,168	466	53	1,745	1,809	1,717	39	69
Piet Retief ...	15,824	5,754	—	464	370	326	49	662	729	805	52	34
Potchefstroom ...	104,130	177,284	—	1,316	2,743	616	140	2,558	2,922	2,939	117	73
Pretoria	46,694	63,677	340	1,233	11,088	305	93	4,079	4,019	4,132	150	137
Rustenburg ...	49,633	71,929	354	916	1,188	196	72	738	801	1,075	54	93
Standerton ...	84,956	79,814	2,438	822	676	2,902	353	5,645	6,222	6,928	86	227
Wakkerstroom ...	74,759	113,308	60	593	297	3,327	210	7,136	6,756	7,098	56	127
Waterberg ...	25,639	36,867	60	679	557	157	51	341	464	469	80	110
Witwatersrand ...	22,260	15,243	600	433	39,232	299	121	7,726	6,414	5,485	172	58
Wolmaransstad ...	17,801	37,178	50	567	287	759	111	1,370	1,603	1,684	3	13
Zoutpansberg ...	27,902	37,093	—	936	840	228	79	816	832	853	121	167
Total for Whites...	1,356,391	1,519,456	6,702	15,707	68,422	18,158	2,311	52,166	52,891	54,709	1,450	1,711
Total for Natives	—	—	—	—	—	—	—	—	5,358	5,791	—	—
GRAND TOTAL	—	—	—	—	—	—	—	—	58,249	60,500	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Total No. of Mules.			Mules died of Disease.	Total No. of Donkeys.			Donkeys died of Disease.	Total No. of Wooled Sheep.			Total No. Bastard and other Sheep.		
	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.
Barberton	245	431	405	52	381	866	951	136	94	699	618	1,227	1,071	1,354
Bethal	154	103	56	1	54	148	106	4	122,863	139,793	145,841	19,091	24,947	20,888
Bloemhof	96	102	88	7	1,023	1,636	1,539	29	67,417	70,065	82,488	101,754	97,862	80,917
Carolina	294	390	317	3	43	669	359	35	62,345	65,999	83,046	10,038	13,621	12,056
Ermelo	849	814	730	25	210	338	605	22	307,444	368,687	376,480	25,039	24,476	20,428
Heidelberg... ...	342	530	350	9	265	435	560	7	136,228	128,960	120,969	47,576	60,036	40,957
Krugersdorp ...	177	201	177	1	153	178	199	1	754	670	1,420	22,333	20,269	16,103
Lichtenburg ...	166	273	139	3	1,284	1,684	1,907	22	62,095	62,470	58,863	64,110	70,523	72,494
Lydenburg ...	758	1,450	982	25	1,045	1,314	1,625	86	70,601	80,945	108,160	19,348	23,978	22,005
Marico	108	349	332	12	728	2,893	3,567	69	767	1,055	295	37,781	26,280	28,993
Middelburg ...	75	438	386	11	383	1,126	1,124	32	56,008	68,490	71,597	39,788	35,297	35,320
Piet Retief... ...	655	581	614	26	307	478	542	35	47,034	51,719	68,682	4,022	3,498	4,482
Potchefstroom ...	329	770	410	2	799	2,142	3,225	1	57,528	58,619	56,328	106,150	90,284	220,105
Pretoria	249	2,440	2,749	34	479	1,884	1,849	40	27,175	18,948	26,500	64,652	64,290	59,238
Rustenburg ...	880	955	965	31	3,293	3,628	4,178	94	910	1,141	1,075	57,817	33,879	32,579
Standerton... ...	362	286	316	3	76	207	197	6	295,784	320,043	301,589	20,418	21,138	13,062
Wakkerstroom ...	231	549	341	2	15	191	88	—	355,706	403,417	425,282	6,584	6,726	6,603
Waterberg... ...	248	852	636	51	503	2,004	2,385	123	206	164	60	34,428	30,710	27,485
Witwatersrand ...	1,188	4,234	3,524	40	250	711	646	4	819	3,388	1,713	12,854	14,874	12,806
Wolmaransstad ...	38	111	49	—	111	370	1,001	7	102,659	86,930	84,854	24,912	22,870	41,273
Zoutpansberg ...	742	1,547	1,592	145	4,838	8,503	15,023	794	2,923	3,343	3,754	51,423	58,951	58,316
Total for Whites ...	8,186	17,406	15,158	483	16,240	31,405	41,676	1,547	1,777,360	1,935,554	2,019,614	751,345	745,580	827,464
Total for Natives ...	—	879	976	—	—	18,042	22,307	—	—	—	—	—	330,772	322,630
GRAND TOTAL ...	—	18,285	16,134	—	—	49,447	63,983	—	—	—	—	—	1,076,352	1,150,094

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Total No. of Sheep died of disease.		Total No. of Angora Goats.			Total No. Boer and other Goats.			Total No. Goats died of disease.		Sheep and Goats killed for consumptn.	Total yield Wool in lb.		Total yield Mohair in lb.	
	Dec. 31 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.		
Barberton	1,197	239	15	78	126	9,092	10.120	13.316	821	1.454	4,585	—	2.030	30	—
Bethal	4,230	14,408	2,452	1,799	1,395	10,829	12,343	9,972	103	763	15,631	578,675	633,821	2,485	3,076
Bloemhof ...	9,564	31,701	59,040	60,149	49,678	25,894	16,343	11,748	8,656	8,883	26,854	352.242	318,128	171,056	111,142
Carolina ...	1,525	4,769	11,206	12,068	10,521	11,153	13,058	7,848	910	1,291	8,930	271.350	407.883	19.525	22,689
Ermelo	14.525	19,898	2,827	3,219	2,438	24,542	26,738	22,607	1,334	3,059	19.190	1,355,430	1,811,839	3.044	7,897
Heidelberg ...	1,713	14.799	6,577	8,563	5,763	38,264	30,498	22,965	399	1,628	21,795	649,290	606,012	11,094	12,320
Krugersdorp ...	2,572	3,531	3.510	3,001	2,609	7,877	6,272	3,885	183	832	31,959	4,25[illegible]	5.600	2,480	1,282
Lichtenburg ...	4,352	19,269	12,560	14,107	12,144	21,970	20,047	14,183	1,409	2,384	26,983	280,011	324,786	26,484	24,828
Lydenburg ...	1,989	3,774	24,033	26,175	23,110	30,640	26,511	34,044	1,074	1,207	19,671	292,135	510,106	58,770	76,840
Marico	3,021	8,020	1,630	2,727	2,158	28,603	19,809	21,566	2,478	4.262	7,475	2,728	5,580	2,860	2,480
Middelburg ...	3,240	5,507	9,119	9,577	8,929	36,177	44,863	32,401	1,491	2,483	12,716	218,413	285,208	16,263	24,571
Piet Retief ...	2,334	3,865	2,247	1.974	2,039	19,789	13,333	12.993	1,621	1.711	3,806	185,194	309,798	3.249	4,860
Potchefstroom ...	11,628	24,146	18,251	21,345	16,149	43,340	48,593	38,281	4,202	3,763	35,411	224,000	242,209	42,693	34,464
Pretoria... ...	4,958	7,960	1,517	2,706	1,741	21,155	25,489	22,363	462	2,579	95.398	154,800	43,405	3,900	1,580
Rustenburg ...	4,395	9,323	1,397	1,687	2,021	38,013	40,570	36,594	1,977	5,061	16,018	4,795	3,800	1,933	3,360
Standerton ...	9,063	21,898	5.815	6,873	13,845	13,434	11,987	5,020	615	694	20,826	1,407,560	1,482,408	13,235	10,808
Wakkerstroom ...	11,224	15,072	11,029	14,937	9,430	39.307	19.211	17,102	1,183	1,703	12,224	1,926,885	2,228,044	27,266	14,447
Waterberg ...	(?) 6	6,642	45	96	69	26,243	27,089	22,374	—	2,674	6,255	140	78	—	60
Witwatersrand ...	1,482	1,338	733	2,092	1,050	5,374	6,612	5,055	149	147	405,488	4,457	3,190	1,120	1,000
Wolmaransstad	2,969	5,979	3,461	19,814	15,036	16,699	13,747	16.786	944	1,116	11,301	721,541	490,432	9,600	36,190
Zoutpansberg ...	3,762	3,242	851	1,118	1,095	59,397	62.826	60,147	2,452	2,709	13,627	8,252	16,230	517	2,996
Total for Whites	99,749	225,380	178,315	214,105	181,346	527,792	496,059	431,250	32,463	50,403	816,143	8,642,148	9,730,587	417,604	396,890
Total for Natives	—	—	—	—	—	—	941,726	896.386	—	—	—	—	—	—	—
GRAND TOTAL...	—	—	—	—	—	—	1,447,785	1,327,636	—	—	—	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	No. Great Stock Stolen.		No. Great Stock Recovered.		No. Small Stock Stolen.		No. Small Stock Recovered.		Total No. of Pigs.		Total No. Pigs killed for consumption.	Total No. Ostriches.		Ostrich Feathers in lb.	Total No. of Poultry.	
	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.
Barberton... ...	3	14	2	1	124	182	6	6	1,092	1,108	275	27	26	30	12,424	15,164
Bethal	—	3	—	—	241	227	9	1	2,201	2,989	1,550	—	—	—	31,441	49,943
Bloemhof	6	18	—	6	1,460	730	121	5	2,085	1,739	1,022	275	494	283	24,724	29,047
Carolina	2	—	—	—	440	1,059	—	17	1,034	1,439	583	—	—	—	15,682	19,623
Ermelo	5	146	2	—	1,349	825	7	4	4,936	5,078	1,301	—	38	—	40,411	48,261
Heidelberg ...	4	41	1	14	616	1,732	5	9	5,280	5,013	1,488	1	41	½	55,714	62,696
Krugersdorp ...	9	9	7	—	185	49	16	—	2,584	1,955	1,489	—	24	—	24,039	28,306
Lichtenburg ...	9	8	—	—	91	284	2	2	3,227	3,145	1,723	438	187	128	46,751	54,085
Lydenburg ...	4	2	4	—	1,403	1,801	27	9	3,617	3,486	1,550	7	18	9	35,725	46,890
Marico	50	14	34	—	365	341	212	29	2,583	2,769	1,290	168	115	89	48,961	31,817
Middelburg ...	1	3	—	2	37	353	—	6	4,683	4,660	2,192	15	63	15	51,413	65,224
Piet Retief ...	2	2	—	—	389	203	23	—	1,320	945	450	—	—	—	14,292	18,059
Potchefstroom ...	42	11	15	—	335	114	24	—	6,798	11,886	3,925	256	691	441	92,356	97,139
Pretoria	2	17	2	12	41	210	2	38	4,406	5,783	6,492	274	169	83	75,641	102,548
Rustenburg ...	7	64	7	—	144	431	19	1	4,827	5,771	3,085	164	372	186½	48,676	74,513
Standerton ...	11	2	—	2	268	626	9	53	3,197	2,453	1,235	—	23	35	55,854	51,729
Wakkerstroom ...	18	5	—	—	804	1,087	3	—	2,035	1,578	601	—	—	—	37,230	31,028
Waterberg ...	25	31	—	1	215	125	25	5	3,506	3,433	1,614	251	432	222	25,832	34,223
Witwatersrand ...	34	55	14	16	127	200	23	4	5,464	4,586	24,768	—	—	—	107,103	90,000
Wolmaransstad ...	—	—	—	—	151	68	30	—	2,173	3,444	1,244	5	33	17	22,007	32,478
Zoutpansberg ...	4	41	—	2	332	652	1	2	4,803	7,608	2,563	675	851	549	49,171	74,815
Total for Whites...	238	486	88	56	9,117	11,299	564	191	71,851	80,868	60,440	2,536	3,577	2,088	915,447	1,057,588
Total for Natives	—	—	—	—	—	—	—	—	95,752	91,163	—	—	—	—	—	—
GRAND TOTAL ...	—	—	—	—	—	—	—	—	167,603	172,031	—	—	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Total No. of Citrus Trees.		Total Oranges Harvested.		Total No. of Vines.		Total No. Fruit Trees other than Citrus Trees.		Irrigated Lands under Cultivation in Morgen.		Dry Lands under Cultivation in Morgen.	
	Dec. 31, 1908.	June 30, 1910.	June 30, 1909.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.
Barberton	19,165	21,196	2,336,600	2,395,020	2,321	2,823	13,917	28,440	1,925½	2,238	10,538	15,486
Bethal	12	13	580	2,000	476	1,014	146,777	171,656	83½	35	25,677	41,857
Bloemhof... ...	245	258	21,750	1,442	31,235	27,182	48,079	36,856	627¾	521	34,795	28,172
Carolina	40	111	8,000	15,117	733	1,752	94,311	108,249	1,678	1,685	7,530¾	9,873
Ermelo	471	249	153,641	33,000	224	369	168,804	210,314	746¼	1,052½	27,312½	41,625
Heidelberg ...	429	760	40,890	178,418	37,442	25,971	280,973	276,751	4,706½	3,815½	62,189	64,047
Krugersdorp ...	3,958	21,094	127,500	1,011,300	11,389	10,550	199,817	225,361	5,772¼	7,960	6,499	8,278
Lichtenburg ...	136	121	1,400	2,250	1,722	3,614	118,002	124,367	1,431¼	2,049½	28,105	32,301
Lydenburg ...	7,454	6,640	1,529,798	2,266,800	1,428	1,750	148,087	135,673	10,253	10,684½	11,151	13,042
Marico	20,859	31,618	3,669,726	3,762,370	34,089	57,570	84,568	46,529	6,301¼	6,577½	8,118	6,002½
Middelburg ...	2,733	826	388,723	323,684	7,048	4,972	183,952	240,195	3,937½	5,302½	28,011	45,225
Piet Retief ...	5,014	4,533	734,905	1,784,532	1,278	1,060	81,741	46,715	1,995	1,195½	11,975½	3,744
Potchefstroom ...	4,179	10,913	480,590	1,411,015	317,610	409,244	313,218	297,098	11,891½	17,616	38,589½	119,395
Pretoria	26,388	32,426	2,843,600	5,192,504	191,086	168,219	295,952	359,122	12,509½	11,773½	31,060	34,359
Rustenburg ...	99,106	113,237	12,587,275	14,396,157	22,557	29,252	275,355	282,208	9,797⅛	11,122	16,382½	12,215
Standerton ...	10	1	—	—	578	638	192,882	194,600	186	227	41,248½	48,019½
Wakkerstroom ...	378	346	79,005	65,100	148	194	130,662	145,378	1,012½	1,278	20,774	13,551
Waterberg ...	26,928	26,543	6,788,322	6,265,217	23,556	57,039	72,615	52,304	4,026	2,687½	51,466	17,105
Witwatersrand ...	1,375	1,073	289,600	130,840	304,205	141,392	135,982	103,725	2,080	7,060½	30,041	58,961
Wolmaransstad ...	—	25	4,000	2,000	104	359	16,743	33,954	395	430½	7,864	15,724
Zoutpansberg ...	42,583	48,780	1,140,061	4,606,390	126,708	127,245	223,822	186,351	4,851	6,002½	29,770	36,525
Total for Whites...	261,463	320,763	33,225,966	43,845,156	1,115,937	1,072,209	3,226,259	3,305,846	86,206⅜	101,314	529,097¼	665,507
Total for Natives	—	—	—	—	—	—	—	—	—	—	—	—
GRAND TOTAL	—	—	—	—	—	—	—	—	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Plantations, in morgen.	Mealies sown and planted, in bags.	Total No. bags of Mealies harvested.			Wheat sown, in bags.		Wheat harvested, in bags.		Oats sown, in bags.		Oats harvested, in bags.	
	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.
Barberton ...	451½	292½	9,900	11,973	15,593½	156	7	404	23	23	43	—	—
Bethal	70½	3,595	93,555	152,735	205,828½	62	705½	822½	6,055	1,229	2,033	6,882	—
Bloemhof ...	17½	481	19,754	26,889	27,418	21	67	604	828	52½	92½	9	—
Carolina	872½	883	14,231	18,215	20,269½	161	249	1,229½	2,073½	784½	1,113	—	759
Ermelo	2,404¾	3,922	56,751	112,657	120,422	59⅜	293¾	503½	2,906½	4,207	5,574½	8,886	15,632½
Heidelberg ...	108½	7,145½	140,496	260,723	294,905	69	770½	3,807½	7,903½	1,256½	3,351½	—	50
Krugersdorp ...	913½	721½	19,800	26,484	33,059	1,013½	1,026	13,805	17,083	1,752½	2,142	—	—
Lichtenburg ...	7,113¼	3,957½	191,405	120,190	212,483½	299⅞	552	4,476	12,808	285½	331	50	—
Lydenburg ...	1,743½	1,070	43,239	48,585	43,568	831½	816	11,897	10,018	1,568½	1,330½	1,236	682
Marico	—	730½	18,423	23,717	21,901	988¼	1,924	21,282⅝	24,315	927½	1,012	—	—
Middelburg ...	2,143	4,063	106,796	166,033	156,568½	792⅛	981	6,433	9,867½	1,438⅛	1,757	507	235
Piet Retief ...	2,031	725½	25,100	21,577	31,396	44⅛	37	257½	264	365¼	377	52	—
Potchefstroom ...	58	5,624	190,653	274,769	347,849½	1,842⅛	2,104½	33,081	34,373	4,262⅛	5,330½	50	143
Pretoria	2,341	3,136	73,486	89,048	102,911	1,500½	1,892	26,622	32,785	3,504	4,271¼	—	13
Rustenburg ...	114½	1,322	25,617	43,835	46,226½	1,434	3,289	20,007	49,718	1,052	1,500	70	12
Standerton ...	192½	4,110	119,062	175,727	174,852½	138⅜	810½	1,640	7,567½	2,949¼	3,737½	1,200	482
Wakkerstroom ...	414½	1,230½	39,123	39,458	36,766	132⅛	206	1,760	2,997	2,857½	3,793½	730	—
Waterberg ...	27¾	1,174	64,242	60,055	64,375½	279	438	3,780	6,014½	415	454¾	378	120
Witwatersrand ...	3,506½	1,212½	68,399	39,979	71,508	—	28½	—	680	50	488	—	180
Wolmaransstad ...	—	1,125	51,929	64,681	50,775	20¼	46	278	817½	3½	26	—	—
Zoutpansberg ...	430¾	1,714	65,868	99,101	100,342	276	266½	3,320½	3,343	749	813½	137	79
Total for Whites...	24,955	48,235	1,437,829	1,876,197	2,179,018½	10,119⅞	16,509¾	156,010⅝	232,440½	29,733	39,572	20,187	18,887½
Total for Natives..	—	—	—	—	1,176,091	—	—	—	—	—	—	—	—
GRAND TOTAL ...	—	—	—	—	3,355,109½	—	—	—	—	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Oat-hay harvested, in lb. Dec. 31, 1908.	Oat-hay harvested, in lb. June 30, 1910.	Barley sown in bags. June 30, 1910.	Barley, harvested in bags. June 30, 1910.	Barley, harvested in lb. June 30, 1910.	Rye sown in bags. Dec. 31, 1908.	Rye sown in bags. June 30, 1909.	Rye harvested in bags. Dec. 31, 1908.	Rye harvested in bags. June 30 1909.	Manna sown in bags. June 30, 1910.	Manna harvested in bags. June 30, 1910.	Manna harvested in lb. June 30, 1910.	Kaffir Corn sown in bags. Dec. 31, 1908.	Kaffir Corn sown in bags. June 30, 1910.
Barberton	75,400	102,112	10½	2	21,360	—	7	—	120	4½	—	84,800	20½	62½
Bethal	2,117,400	5,818,760	13	93	—	—	1	—	8	56½	—	2,139,980	53¾	67½
Bloemhof ...	161,000	285,400	12¼	3	8,400	—	—	—	—	1½	—	24,360	144	185¾
Carolina	1,535,000	1,996,120	45¾	326	6,000	2	½	42	11¼	10¾	6	283,160	17⅛	91¾
Ermelo	5,268,280	6,923,348	57	223	11,400	—	1	—	4	42	12	1,169,152	168¾	175¾
Heidelberg ...	1,390,343	7,946,816	12½	126	—	3	4	20	22	232½	—	6,485,052	162	232½
Krugersdorp ...	1,355,910	7,789,948	36¾	630	—	—	—	—	—	18	—	698,860	60⅜	15
Lichtenburg ...	995,248	1,085,980	27	377½	—	—	—	—	—	7	—	246,360	129	71
Lydenburg ...	3,019,872	6,741,708	41½	616	—	—	2	58	30	¼	—	5,200	30¾	23¼
Marico	4,501,057	3,774,476	269	164½	9,600	1¾	2	—	20	1½	—	17,240	102¼	37
Middelberg ...	3,461,316	4,207,296	61	1,235	64,400	—	12	3¼	104	41	—	1,312,024	125½	159½
Piet Retief ...	1,137,080	773,360	7¼	60	—	⅛	—	—	—	4	8	44,800	137⅛	100
Potchefstroom ...	17,544,370	13,143,976	203	681½	410,940	—	14	—	124	108¼	—	2,895,036	329	334½
Pretoria	5,506,678	14,912,688	229	314½	514,600	—	1	—	14	226	128	3,076,884	249⅞	102
Rustenburg ...	3,632,520	4,211,000	21½	159	28,400	2⅜	5¾	41	103	9½	—	405,960	142½	78½
Standerton ...	6,227,577	11,469,192	23½	142	42,648	—	3¼	—	9	172	—	3,872,244	151¾	47½
Wakkerstroom ...	8,316,640	10,166,400	117½	905	55,692	—	¼	—	1	17	—	393,080	241	72
Waterberg ...	848,400	1,410,116	7½	34½	—	9¾	12	30½	128	6¾	5	60,680	84	62¼
Witwatersrand ...	937,060	2,821,180	326	40	1,314,960	—	1	—	15	56½	—	518,868	(?)	95¼
Wolmaransstad ...	22,000	71,600	2½	10	—	—	—	—	—	2½	—	23,520	36	31
Zoutpansberg ...	2,477,800	2,667,060	42	705	91,232	3	¾	16½	6¼	24½	823	58,960	137	264
Total for Whites	70,530,951	108,318,536	1,566	7,147½	2,579,632	22	67½	222¼	719½	1,042½	982	23,816,220	2,522¼	2,308½
Total for Natives	—	—	—	—	—	—	—	—	—	—	—	—	—	—
GRAND TOTAL ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Kaffir Corn harvested in bags.			Ground-nuts Sown, in bags.	Groundnuts harvested, in bags.		Potatoes planted, in bags.		Potatoes harvested, in bags.			Cotton planted, in morgen.	Cotton harvest'd, in lb.	Tobacco planted, in morgen.	
	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.	Dec. 31, 1908.	June 30, 1909.	June 30, 1910.	June 30, 1910.	June 30, 1910.	Dec. 31, 1908.	June 30, 1910.
Barberton	283	860	1,531	21	71½	566	331½	793½	1,227	1,301	3,438½	25	2,600	20¾	25
Bethal	1,926	3,485	2,852	—	2	—	2,188	2,268½	16,575	5,557	18,852½	—	—	7⅝	7
Bloemhof	9,823	15,124	3,950½	3⅝	—	17	328	225¾	1,416	962	1,059¼	—	—	18	19¼
Carolina	147	1,409	1,697	—	—	—	631	763	2,704	2,404	5,251	—	—	30½	36¾
Ermelo	2,576	5,523	2,747	⅛	—	2	995½	1,848¼	5,398	6,536	9,818½	—	—	8⅜	13¼
Heidelberg ...	17,934	26,695	16,699	—	—	—	1,180½	1,465	5,283	5,898	12,058	—	—	5½	4¾
Krugersdorp ...	1,735	1,383	605	—	20	—	2,004	2,412½	12,043	6,547	16,868	—	—	433	349¼
Lichtenburg ...	14,217	25,958	7,676½	¾	—	16	258¼	349	856	862	1,935	—	—	27	73½
Lydenburg ...	618	1,073	770	25½	6	195	587½	1,163¼	3,320	3,645	9,132½	10	8,000	50	24¾
Marico	4,185	2,947	801½	3	11	42	729⅛	769	2,031	1,133	4,690	—	—	118½	67
Middelburg ...	2,782	5,274	2,091	3¼	5	13	811¾	961½	2,839	3,009	5,792½	—	—	66⅝	27¼
Piet Retief ...	2,068	969	2,074	½	143½	9½	158	189½	860	944	835	—	—	207⅝	197
Potchefstroom ...	26,162	38,124	31,022½	⅛	—	2	4,640¼	7,539	17,598	22,029	33,150	—	—	195	250
Pretoria	4,793	4,689	2,577	44	80	1,609½	1,789	3,802¼	9,811	12,182	24,789¾	—	—	95½	129
Rustenburg ...	4,218	6,668	1,965	4⅜	27½	102¾	347	866	1,756	1,543	5,192½	2½	1,050	1,662½	2,018½
Standerton ...	3,286	3,874	1,543	3	—	7	3,103½	4,431¾	24,601	20,476	53,891¾	—	—	32¾	11½
Wakkerstroom ...	2,450	1,447	1,624	½	—	3½	1,465½	1,130½	7,647	4,544	6,304½	—	—	8⅝	10½
Waterberg... ...	4,666	3,914	1,587	15¾	458	151	485⅞	977¼	2,847	6,116	5,867	—	—	117¼	56¾
Witwatersrand ...	3,689	1,239	5,961	—	—	—	—	4,162	30,341	11,266	28,145	—	—	3½	1¾
Wolmaransstad ...	3,054	17,866	2,608½	—	—	—	92	54½	332	171	264	—	—	12½	13½
Zoutpansberg ...	2,990	11,344	9,804½	325½	571½	7,179	954	1,582	5,965	6,005	10,477½	47½	38,115	551½	122
Total for Whites ...	113,602	179,865	102,187	451	1,396	9,915¼	23,080¼	37,754	155,450	123,130	257,812¾	85	49,765	3,672⅝	3,458¼
Total for Natives ...	—	—	555,657	—	—	—	—	—	—	—	—	—	—	—	—
GRAND TOTAL ...	—	—	657,844	—	—	—	—	—	—	—	—	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Tobacco Harvested, Dry Leaf and Roll, in lb.		Lucerne Planted, in morgen.	
	June 30, 1909.	June 30, 1910.	December 31, 1908.	June 30, 1910.
Barberton	19,185	21,850	4½	14
Bethal	11,281	8,530	11	11
Bloemhof	5,608	16,350	22	31¾
Carolina	35,826	42,514	1⅜	1
Ermelo	25,788	9,722	2½	2
Heidelberg	7,228	2,900	405¼	369½
Krugersdorp	291,150	561,825	52	86½
Lichtenburg	25,563	163,954	8¾	27½
Lydenburg	92,957	71,844	7	8½
Marico	74,387	102,650	62¼	90½
Middelburg	76,271	199,550	117½	½
Piet Retief	289,078	334,392	—	½
Potchefstroom	256,205	877,292	823⅜	1,364
Pretoria	89,311	109,952	138	382½
Rustenburg	1,208,274	2,478,370	3	76¼
Standerton	45,145	13,306	25	9
Wakkerstroom	15,710	11,724	4	—
Waterberg	65,935	66,220	52¾	33¼
Witwatersrand	85,335	490	138¾	194½
Wolmaransstad	139	14,720	—	3
Zoutpansberg	171,074	238,275	50	76
Total for Whites	2,891,450	5,346,130	1,929	2,781¾
Total for Natives	—	—	—	—
GRAND TOTAL	—	—	—	—

COMPARATIVE AGRICULTURAL STATISTICS FOR THE TRANSVAAL FOR THE YEAR ENDED 31ST DECEMBER, 1908, SIX MONTHS ENDED 30TH JUNE, 1909, AND YEAR ENDED 30TH JUNE, 1910.

DISTRICT.	Areas of District.		Number of Registered Farms.		Number of Farms Surveyed to June, 1910.		Area of Farms Surveyed.		Number of Registered Farms Remaining Unsurveyed 30th June, 1910.		Area of Registered Farms Remaining Unsurveyed 30th June, 1910.		Area of Government Ground not Divided into Farms.		Area of Government Ground.	
	Sq. Miles.	Morgen.	Govt.	Private.	Govt.	Private.	Sq. Miles.	Morgen.	Govt.	Priv.	Sq. Miles	Morgen.	Sq. Miles	Morgen.	Sq. Miles.	Morgen.
Barberton ...	4,679·57	1,415,010	116	160	116	95	4,638·57	1,402,590	0	5	41	12,420	3,042	919,840	3,512	1,061,959
Bethal	1,270·04	384,035	4	136	4	135	1,267·04	382,985	—	1	3	1,050	—	—	30	9,071
Bloemhof ...	3,193·53	965,661	78	257	77	256	3,181·53	961,961	1	1	12	3,700	—	—	475	143,630
Boksburg ...	270·57	81,814	6	24	6	24	270·57	81,814	—	—	—	—	—	—	18	5,377
Carolina ...	2,095·72	633,704	7	208	7	200	2,022·72	611,754	—	8	73	21,950	—	—	124	37,495
Ermelo	3,003·43	908,178	51	221	51	219	2,994·43	905,348	—	2	9	2,830	—	—	474	143,328
Germiston ...	102·03	30,852	2	14	2	14	102·03	30,852	—	—	—	—	—	—	8	2,595
Heidelberg ...	2,351·61	711,081	7	225	7	225	2,351·61	711,081	—	—	—	—	—	—	46	13,909
Johannesburg	184·18	55,692	—	26	—	26	184·18	55,692	—	—	—	—	—	—	2	486
Krugersdorp	1,174·67	355,197	7	111	7	111	1,174·67	355,197	0	0	0	0	—	—	8	2,347
Lichtenburg	4,478·81	1,354,304	39	338	39	336	4,461·81	1,349,304	—	2	17	5,000	—	—	414	125,185
Lydenburg ...	10,176·84	3,077,276	304	690	293	659	9,890·84	2,990,926	11	31	286	86,350	—	—	2,720	822,474
Marico ...	3,636·89	1,099,724	61	221	61	220	3,624·89	1,095,988	—	1	12	3,736	—	—	1,070	323,546
Middelburg ...	5,028·98	1,520,664	25	477	25	464	4,951·98	1,497,464	—	13	77	23,200	—	—	339	102,506
Piet Retief ...	1,615·93	488,625	20	204	20	202	1,605·93	485,601	—	2	10	3,024	—	—	239	72,268
Potchefstroom	4,904·15	1,482,918	59	395	57	393	4,892·15	1,479,318	2	2	12	3,600	—	—	280	84,666
Pretoria ...	6,641·54	2,008,272	41	568	38	562	6,587·54	1,991,872	3	6	54	16,400	—	—	164	49,420
Rustenburg ...	9,730·73	2,942,381	228	795	225	783	9,587·73	2,899,051	3	12	143	43,330	—	—	1,579	477,458
Standerton ...	2,003·62	605,855	11	190	11	190	2,003·62	605,855	—	—	—	—	—	—	43	13,002
Wakkerstroom	2,197·76	664,559	3	277	3	275	2,191·76	662,709	—	2	6	1,850	—	—	90	27,214
Waterberg ...	15,625·77	4,724,925	849	1,537	815	1,371	14,693·77	4,443,175	34	166	932	281,750	—	—	4,747	1,435,399
Wolmaransstad	2,061·69	623,414	32	162	31	159	2,033·69	614,989	1	3	28	8,425	—	—	144	43,543
Zoutpansberg	23,997·78	7,256,455	1,317	1,343	1,316	1,333	23,975·78	7,249,680	1	10	22	6,775	5,969	1,804,907	17,195	5,199,428
TOTAL ...	110,425·84	33,390,596	3,267	8,519	3,211	8,252	108,688·84	32,865,206	56	267	1,737	525,390	9,011	2,724,747	33,721	10,196,306

Disappointing Settings of Eggs.

By R. BOURLAY, Poultry Expert (Transvaal).

THE number of settings of eggs sold annually throughout South Africa must be enormous, but the results obtained from many of these are not very encouraging to the beginner. It must not be supposed from this that the vendors of settings are dishonest—far from it—for the great majority take every precaution to ensure good results from settings supplied by them and are quite as much worried over the failures as the purchasers. It must always be borne in mind by purchasers, however, that so soon as the eggs have left the hands of the vendor his responsibility ceases, and it is always rather annoying to him that he should be blamed for bad results, the reasons of which are frequently due to no fault or neglect on his part, but are rather owing to causes which are entirely beyond his control.

When failures occur the blame is nearly always laid at the door of the vendor, who, poor man, often has a lot to put up with from many of his customers. The latter invariably inform him that their best hen has been put on the eggs and that she sat splendidly; further, that another hen, set at the same time on eggs from their own yard, brought out 100 per cent., and they quite ignore the fact as a rule that the bought eggs have travelled by rail for a distance of anything between 25 and 300 miles with possibly a cart journey at the end. It is to this rail journey that so many of the bad hatches from travelled settings of eggs are due, for no matter what precaution one may take there is always a very great risk of injury, generally due to rough and careless handling in transit. It is no uncommon thing to see the Kaffir boy receiving the parcels from the van of a train which has just arrived, in fact it is usual, and it is rather too much to expect that natives will discriminate between a box of eggs for setting and a parcel of merchandise. The one receives the same treatment as the other, and this is not always what one would require. It is just here that so many settings get spoilt, due to breakage of the yolks or of the eggs themselves.

Another source of danger lies in the method of transit from the railway station to the purchaser's house. In towns where the railway deliver parcels it is better to arrange that the eggs shall be called for at the station and not be delivered by the van, for the jolting of this vehicle is not conducive to good hatching results. If they have to be taken to an outlying farm in a cart, they should not be allowed to jolt about at the bottom of the vehicle, but should be carefully held in the hand so that the vibration may be reduced to a minimum. Above all, it must be remembered that travelled eggs should always be allowed to rest for twenty-four hours or even thirty-six hours after arrival before being set, for no matter how much care may have been taken in their transportation the effect of the journey has undoubtedly been felt and they must be allowed time to settle before incubation is commenced.

Reference is made above to broken yolks. Many people have mistaken these as unfertiles and have returned them as such, for when

the yolk of an egg breaks before incubation commences, it is an easy matter to confuse the two. This mistake is quite natural, though in such cases it is distinctly unfair that the vendor should be held responsible, for the damage is invariably done after the eggs have left his hands and is due to circumstances over which he has no control.

The wisdom of commencing poultry keeping by the purchase of settings of eggs is open to question. Firstly, one has to wait for several months before the birds are old enough to breed from, and practically a whole year is wasted. Secondly, as pointed out above, there is always more or less risk of injury to eggs during transit. Thirdly, the purchaser cannot see what quality of stock he is getting, for an egg gives no indication of this. Fourthly, supposing that ten chickens are hatched out of a setting, there are sure to be a number of cockerels which in all probability are blood brothers to the pullets, and cannot therefore be mated up with them. It is thus necessary to purchase another male bird for this purpose.

It is true that a setting of eggs can generally be obtained for considerably less money than one good bird will cost, but is it not better to expend the value of eight or ten settings of eggs and get a pen consisting of three or four birds?—for by doing this one can with ordinary luck hatch out enough chickens to give a four or five fold return on the original expenditure. The risk of damage to eggs by transit is obviated, the breeder knows what class of stock he is breeding from, and at the end of the season, barring accidents, he has not only a good number of chicks, but also the original pen of stock birds. Whereas at the end of that same time, had he bought settings of eggs, he would only have had such chicks as he had succeeded in rearing from the limited number of eggs.

Poultry Houses.

By R. BOURLAY, Poultry Expert (Transvaal).

THE subject of poultry houses is one which has received a good deal of attention from most poultry-keepers in South Africa, for, owing to the conditions peculiar to this country, it is a problem which is not so readily solved as in other parts of the world. We have many climates in South Africa, so that what may meet the requirements of one part of the country is probably totally unsuitable for another. It would be interesting if one were able to give photographs of some of the so-called poultry houses seen in different places in the course of one's travels, for they vary from an oven (which is still used for baking purposes) to the elaborate and expensive house imported from some colder country, and which is not as a rule suitable to this portion of the globe.

This subject was dealt with in the *Transvaal Agricultural Journal* for April, 1903, but as it is not always possible to obtain back numbers there will be no harm in going over the ground again.

It is the custom with many poultry-keepers to allow the fowls to roost entirely in the open—either in trees, if such are available, or otherwise on a few poles which are erected for the purpose, but are absolutely devoid of covering or shelter of any kind. It is often claimed that the birds are healthier in such circumstances than those which are provided with houses. This, in a way, is only natural, for only those possessing sound constitutions can be expected to survive the varying climatic changes, and such survivors would naturally be healthy; but they cannot be expected to lay so well as birds which are protected from the weather.

It is, I consider, a mistake to allow fowls to roost in trees, for it is seldom that a poultry-keeper will take the trouble to examine the trees in which the birds roost to see whether insects are hiding under the bark or in the cracks of the broken boughs; and even if he does think of this it is a very difficult undertaking in many cases to rid the tree of such pests. Further, the birds are quite out of control and are not easy to catch, roosting as they invariably do on the highest branches.

Houses cost money we know, but I do not wish to suggest that elaborate and expensive houses should be erected. Far from it—the simpler the better, provided that simplicity and cheapness can be combined with effectiveness.

There are many opinions as to what is the best material to use in the construction of poultry houses, for nearly every thing has its disadvantages. Wood is undoubtedly the most common, and provided that it is of sufficient thickness it is hard to beat, for if kept well tarred and painted it is durable; but care must be taken to see that the boards fit closely together, or otherwise the heat will make them warp, thus causing draughts which are fatal.

Corrugated iron is frequently used and has its advantages, for it is water-proof—practically everlasting—and it is an easy matter to build a house of this material. Its chief drawback is that it is too rapid a conductor of heat and cold, affording little or no protection from the sudden changes of temperature during the winter or summer.

I have found that chicken fleas breed very rapidly during the summer in iron houses, and for this reason have discarded them as unsuitable.

Brick houses are occasionally seen, but I do not consider that these are very suitable, for though they may be comparatively warm in winter and cool in summer, yet they generally afford such excellent harbours for poultry parasites that when once a brick house becomes infected it is a very difficult matter—and, indeed, often an impossibility—to get it clean again.

There is another material which I have tried with considerable success, namely "ruberoid". There are also other similar preparations such as "Congo roofing", "malthoid", etc., which answer equally well. These are not such rapid conductors of heat and cold as iron, and the cost is if anything rather less. In building a house with either of these compositions it is necessary to stretch wire netting on the roof to act as a support, or otherwise it is liable to sag. It is also wise to put wire netting on the sides of the house on the inside of the material, as this acts as a strengthener and prevents its being broken—2 or 3 in. mesh netting is quite sufficient for this purpose. It must be borne in mind, however, that owing to the destructible nature of such preparations referred to above houses made of any of these materials must be protected from cattle, etc., or they will soon be destroyed.

In the construction of poultry houses a certain amount of wood has to be used for the frame-work, doors, etc., and whether iron or one of the above-mentioned materials is used the quantity of wood is practically the same, but this limited quantity is far more easily kept clear of insects than is the case if the whole house is composed of wood. This is rather an important point, for when a wood house becomes infested with insects (especially fowl-ticks) it is not always an easy matter to get rid of them.

On farms there is another method of housing poultry which has the advantage of being cheap yet effective; that is by building a shelter of turf sods, a method well known in South Africa. The roof can be formed of iron with turf laid over it to serve the double purpose of keeping it in place and preventing too great a variation of temperature.

Such houses are inexpensive, as a couple of kaffirs can build one in a short time. Should they become infested with insects it is not a serious matter if one has to destroy them and build afresh every year on another site. The iron in such cases can be used again, as also can such wood work as is required after it has been well treated with either paraffin, coal tar, or carbolineum; or the same purpose is served if it is passed slowly through a hot fire.

These houses, provided that sufficient ventilation is afforded, are cool in summer and warm in winter, and it is rather surprising that they are not more generally used in a country such as this where the cost of building material is always a serious consideration.

The different types of poultry houses vary very considerably, but provided that a few essential details in construction are observed the more simple they are the better. Elaboration of detail and ornamental work are not of any material benefit to the birds but rather the reverse, for as a rule this sort of thing—besides being costly and unnecessary—only affords extra hiding places for poultry pests.

The size of the house must be determined by the number of fowls it is proposed to accommodate. It should always be remembered,

however, that small flocks of birds give proportionately better results than when large numbers are running together on the same ground, consequently it is better to keep poultry in small lots rather than in one large flock. It is, therefore, not advisable for more than fifty to be accommodated in any one house, though twenty-five is the more suitable number; whereas, of course, in breeding pens only small numbers of birds are kept together.

The chief points to be borne in mind when building poultry houses are as follows:—

Plenty of ventilation without draught, dry floor, low perches, and admittance of sunshine during the day.

The house should not be less than 6 ft. in height, although in some instances it is necessary to add another foot in order to get sufficient slope to the roof.

The ventilators should always be at the highest point in order that the bad air which rises upwards may be carried away. Insufficient ventilation is a very common fault in poultry houses in South Africa, especially when they have been constructed on principles copied from catalogues of English appliance manufacturers. Another common error which is frequently seen is that of providing ventilation space at the bottom of the house, which allows the draught to blow upwards so that it easily penetrates the feathers of the birds while roosting. The necessity of a dry floor is obvious, for if this is damp the droppings from the birds soak into the earth and the smell which arises is a source of danger. As a floor of a house we prefer hard, dry earth which can be sprinkled with sand; cement is too hard and cold, and wooden floors are, I consider, an unnecessary expense.

The perches are always an important point. These should be all on the same level, 18 in. or 2 ft. from the floor of the house, 2 ft. from the sides, and the same distance apart. If one perch is higher than the others the fowls will naturally all endeavour to roost on it. This usually results in their all crowding on to the one, and some are certain to be knocked off with considerable risk of injury. If the perches are too high there is always a certain amount of danger of bumble foot, especially with the heavier breeds, caused by the fowls alighting from too great a height on to the hard floor.

Ordinary 3 in. × 2 in. scantling is preferable for perches. This must be carefully planed to remove any splinters, and the square edges should be rounded off. If boughs of trees are used for the purpose it is well to remove all the bark before placing them in the house and to keep a careful watch for insects in the cracks which will inevitably appear as they dry off.

Nest boxes should be as simple as possible. I seldom use these, but prefer to loosen the ground in the corners of the house where the birds will be quite content to lay. But if boxes are used they should be movable, in order that they may be easily cleaned and clean straw or chaff should be placed inside. But with poultry kept in confinement it has been my experience that the fowls usually scratch the majority of the latter out of the nest boxes, thus causing considerable risk of injury to the eggs when being laid owing to their dropping on to too hard a surface and being cracked.

Light is very necessary in poultry houses, for sunshine is a great purifier; consequently the house should if possible be placed where the sun will shine into it for an hour or two every day.

Types of Poultry Houses.

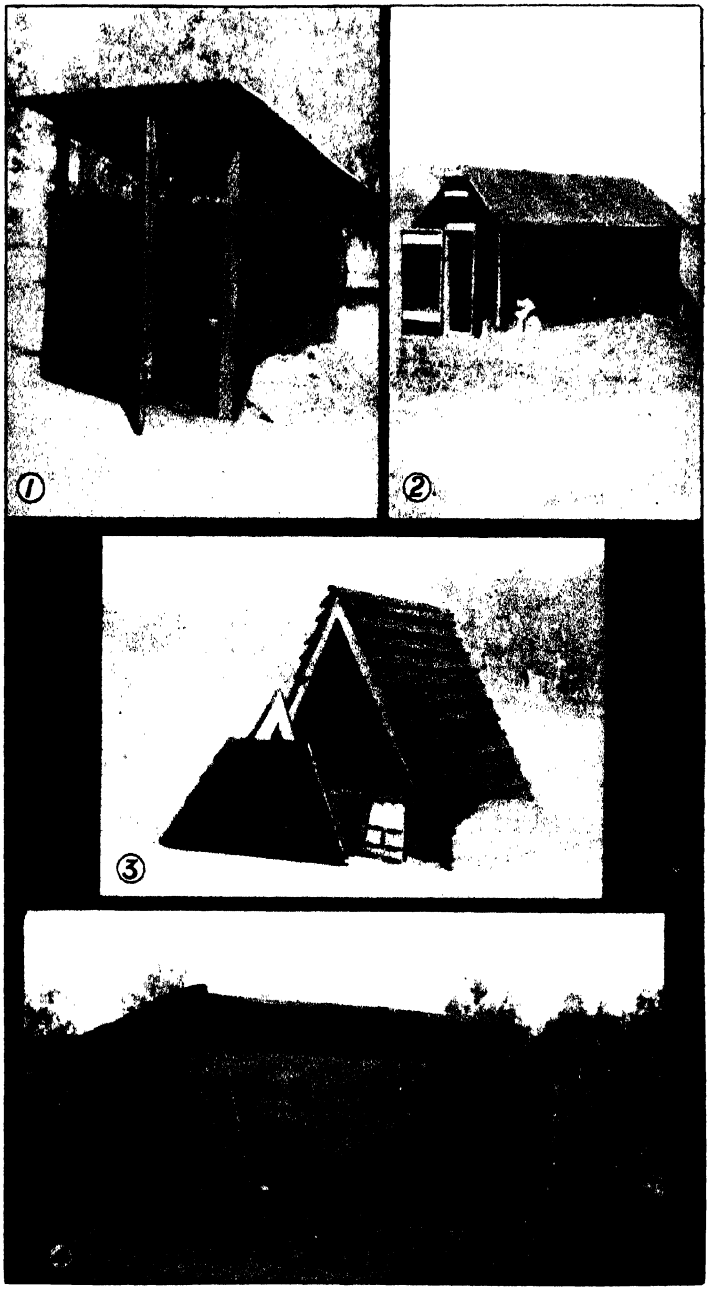


FIG. 1.—A type of house which has proved satisfactory at Potchefstroom. Note the ample ventilation. FIG. 2.—Another type of house in use at Potchefstroom but one which is not so satisfactory owing to the insufficient ventilation. There is a small ventilation space half an inch deep running the entire length of both sides of the house underneath the eaves, which is not shown in the photograph. FIG. 3.—A type of house well suited to windy districts; in hot weather the door can be left open. It is easily constructed and can be made in four parts which can be securely fastened with eight bolts and nuts. FIG. 4.—Poultry house covered with Congo roofing which has given very satisfactory results. The size of this house can be modified according to requirements, but if placed in a windy spot it is necessary to secure it, or it may be turned over in a strong wind owing to the light nature of the material employed in its construction.

Provided that sufficient ventilation be allowed, as indicated, at the highest point of the house and close under the roof (and in this respect I prefer to err on the side of allowing too much rather than too little) there is no objection to using iron for the roof. This substance is not only cheap but also durable, and weatherproof, and with a good current of air passing underneath the heat of it does not affect the lower parts of the house during the day time.

Poultry houses should, if possible, be placed in a sheltered position where they are not exposed to either the prevailing or cold winds, and should always face the quarter from which the fewest winds blow.

Cleanliness is a very necessary detail in poultry-keeping, and the roosting places should receive regular attention. Not once every three months, as is so often the case on farms, but all droppings should be removed and the floor well cleaned regularly every week or oftener. The manure so obtained should be carefully saved, for it is valuable and is in great demand by those who realize its qualities. Very few farmers appear to appreciate its full value. It is very strong, and consequently must be spread very lightly on the ground so that—though it may not be very plentiful—a little goes a long way.

During the summer months it is most necessary to keep a vigilant eye on the poultry house to guard against the spread of insects, for in a hot country like ours these pests breed at an alarming rate. Perhaps the worst of these is the fowl-tick, commonly, though erroneously, known as the Tampan. This pest is, I consider, one of the greatest curses to poultry-keepers in South Africa, and frequently its presence is entirely unsuspected in a poultry house, in spite of the fact that the birds may be regularly dying off owing to its attacks.

It is a good plan to thoroughly white-wash the house once every two or three months, as this acts as a purifier and keeps the place sweet and clean, but it must not be imagined that this will keep it entirely free from insects. Neither fowl-ticks nor red mite appear to mind white-wash in the least, and stronger measures have to be adopted for their extermination.

It is sometimes necessary to disinfect the floor of a poultry house, and this can be done by using one of the many liquid dininfectants, but occasionally lime is used for the purpose. In such cases it is necessary to see that it is well slaked, for the use of unslaked lime in poultry houses is very risky. There are many instances where numbers of birds have been killed through it.

Overcrowding is another great but very common mistake, for when too many fowls are roosting in a house, no matter how well it may be ventilated, it is almost impossible for them to obtain a sufficient supply of fresh air, for the oxygen will become exhausted too rapidly. Poultry kept under these conditions cannot be expected to thrive; on the other hand they invariably look seedy and out of sorts.

Two square feet of floor space for each bird is a very sound principle to adopt as a basis, though under favourable conditions that may be slightly reduced.

Western Province Agricultural Society.

THIRD EGG-LAYING COMPETITION.

(Commenced 1st May, 1910; to finish 30th April, 1911.) (Four Birds to a Pen.)

Record for JANUARY, and Totals to end of January, 1911.

Pen Number.	Owner.	Breed.	Record for Month. Eggs.	Weight. oz.	dwts.	Total to Date. Eggs.	Weight. oz.	dwts.	Position to Date.
1	W. P. Cowan....	White Leghorns (Eng.).......	52	104	6	389	727	11	8th
2	B. Kauffmann...	Brown Leghorns.............	35	68	0	363	669	10	11th
3	K. B. Jobling....	White Wyandottes...........	32	66	3	314	608	15	13th
4	R. G. Hudson...	Brown Leghorns.............	19	37	1	224	448	2	30th
5	K. B. Jobling....	White Leghorns (Aust.-Amer.).	34	70	6	338	652	2	12th
6	S. A. West......	White Leghorns (Amer.)......	23	48	5	348	705	10	9th
7	A. F. Rackstraw.	White Wyandottes...........	17	35	14	160	331	12	47th
8	J. W. Wright....	White Wyandottes...........	21	39	3	219	414	1	35th
9	R. W. Hazell....	Columbian (1 dead)..........	5	9	12	108	214	6	52nd
10	S. A. West......	White Leghorns (Amer.)......	36	74	6	281	559	1	15th
11	C. H. v. Breda...	White Leghorns (Amer.)......	36	78	11	236	488	3	24th
12	S. C. Skaife......	White Wyandottes...........	23	40	12	259	471	13	27th
13	R. W. Hazell....	White Orpingtons...........	12	26	7	182	375	0	41st
14	Clif. Hoole......	Buff Leghorns...............	21	40	14	256	492	9	23rd
15	F. T. Hobbs.....	Silver Wyandottes...........	26	53	2	207	382	10	39th
16	B. Kauffmann...	Black Minorcas (1 dead)......	19	42	9	149	329	6	48th
17	S. C. Boyes......	White Leghorns (Amer.)......	45	91	12	447	883	6	2nd
18	A. Aitken.......	White Leghorns (Amer.)......	55	103	6	433	825	8	4th
19	F. Muller.......	Black Minorcas..............	8	17	3	164	338	0	46th
20	B. Kauffmann...	Brown Leghorns.............	23	44	8	258	464	11	28th
21	R. W. Hazell....	White Wyandottes (1 dead)...	12	23	12	161	322	14	49th
22	J. P. Seabrook...	Blue Andalusians............	55	113	13	270	549	15	16th
23	S. A. West......	Red Sussex.................	22	42	0	198	369	2	43rd
24	R. W. Hazell....	White Wyandottes...........	19	39	3	249	494	2	22nd
25	J. Leibbrandt...	White Wyandottes...........	16	33	8	229	451	12	29th
26	R. G. Hudson...	Black Wyandottes...........	29	56	7	266	505	9	19th
27	H. H. Bright....	White Leghorns (Eng.).......	20	40	8	223	441	6	33rd
28	O. C. Macpherson	White Leghorns (Amer.)......	26	52	13	222	442	0	32nd
29	H. H. Bright....	Black Leghorns (1 dead)......	25	47	7	235	426	12	34th
30	H. H. Bright....	White Leghorns (Eng.).......	12	23	13	194	387	0	38th
31	C. H. v. Breda...	White Leghorns (Amer.)......	44	80	15	379	703	7	10th
32	S. Smith........	Brown Leghorns (3 dead).....	15	29	13	280	513	0	18tb
33	F. T. Hobbs.....	Silver Wyandottes...........	17	33	0	130	245	13	51st
34	A. Keppie.......	White Wyandottes...........	38	71	2	286	523	7	17th
35	C. H. v. Breda...	White Leghorns (Aust.).......	52	98	5	539	959	0	1st
36	S. Smith........	White Leghorns (Danish-Am.).	20	39	12	405	759	0	6th
37	F. T. Hobbs.....	Silver Wyandottes...........	18	32	3	203	364	9	44th
38	Vacant.........	—	—	—	—	—	—	—	—
39	C. H. v. Breda...	White Leghorns (Aust.-Amer.).	41	79	12	462	847	9	3rd
40	R. J. Williams...	Black Minorcas (2 dead)......	11	27	0	82	196	8	53rd
41	F. Muller.......	Black Minorcas (1 dead)......	19	40	4	187	380	3	40th
42	C. H. v. Breda...	White Leghorns (Amer.)......	26	57	5	228	497	7	20th
43	I. E. Wright.....	Brown Leghorns (2 dead).....	5	10	4	133	269	14	50th
44	C. H. v. Breda...	White Leghorns (Aust.-Amer.).	17	32	3	397	765	6	5th
45	B. Kauffmann...	White Leghorns (Eng.).......	41	82	1	225	443	9	31st
46	S. A. West......	Brown Leghorns..............	44	88	8	246	475	6	26th
47	R. W. Hazell....	Black Orpingtons...........	15	29	15	208	403	14	36th
48	C. W. Pilkington.	Rhode Island Reds..........	26	58	0	182	398	4	37th
49	S. Smith........	Brown Leghorns (2 dead).....	7	15	3	205	373	12	42nd
50	C. H. v. Breda...	White Leghorns (Aust.-Amer.) (1 dead)	47	87	14	417	737	14	7th
51	K. B. Jobling....	White Leghorns (Aust.-Amer.) (1 dead)	30	61	5	247	477	11	25th
52	S. A. West......	Brown Leghorns (1 dead).....	26	49	6	191	363	15	45th
53	N. Cole.........	Brown Leghorns..............	24	48	10	304	592	1	14th
54	K. B. Jobling....	White Leghorns (Amer.).......	29	57	4	255	494	11	21st

Citrus Fruit Export, 1911.

By R. A. DAVIS, Government Horticulturist (Transvaal).

THE coming season should prove one of the most successful for the above business. The enormous influx of visitors to London to attend the Coronation festivities in June should provide a market for the disposal of greater quantities of citrus fruits than have hitherto left our shores.

The following notes may possibly be useful for intending exporters:—

All fruit should be cut, and not plucked, from the tree, and care taken that the skin is not injured in any way, as the slightest scratch is sufficient to cause decay. Pickers should wear leather gloves and cut the fruit with special "orange clippers", made with rounded points in order to reduce the risk of injury to a minimum.

Fruit should be picked into sacks or other suitable receptacles, of which there are one or two kinds on the market, and emptied carefully (not thrown) into the boxes which are to convey it to the packing-house. Each particular fruit should be handled as carefully as you would handle an egg.

No fruit injured by hail or showing the presence of scale insects should be exported; slight marks caused by rubbing against the leaves (known as wind marks) do not matter. The utmost care should be taken to guard against the inclusion of fruit suffering from the attacks of fruit fly and orange codling moth.

Before packing in export boxes all oranges and nartjes should be allowed to remain for two days after picking. This is in order that a certain amount of shrinkage, which proceeds most rapidly during the first forty-eight hours, may take place and also to admit of a little toughening of the skin.

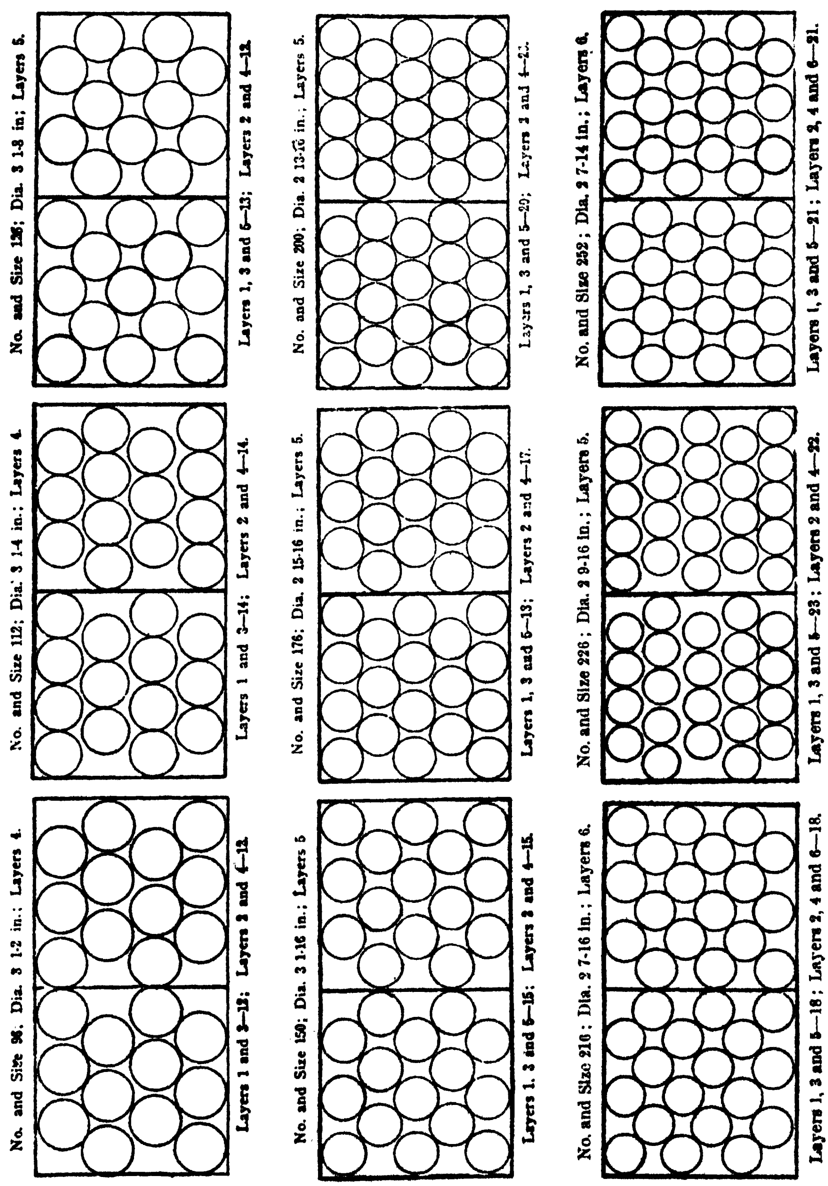
The standard size orange box, which alone is recommended, for ordinary and small sized fruit measures $26 \times 12\frac{1}{2} \times 12\frac{1}{2}$ in. outside.

Half-boxes, which may be used for specially fine fruits, measure $13 \times 12\frac{1}{2} \times 12\frac{1}{2}$.

Oranges for export must be sorted to size. This can only be done in a satisfactory manner by the use of a machine. There are several makes on the market, and in addition it is quite possible to produce a home-made article which will be fairly suitable for small growers. The standard sizes in use are 96, 112, 126, 150, 176, 200, 216, 226, 252; of these the most acceptable are 150, 176, 200. These are arranged in the boxes as shown in the accompanying diagram.

The packing should be done by girls; they work quickly and are more deft and neat than boys.

In order to avoid the slightest possibility of any abrasion to the skin of the fruit, their finger nails should be trimmed short. Each fruit is wrapped in paper before being placed in the box. Specially



Showing Method of Packing Citrus Fruits.

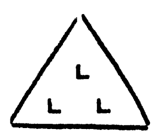
prepared wrapping paper, bearing the name or brand of the grower, is procurable in sizes suitable as follows:—

For 96, 112, 126—12 × 12 in.
For 150, 176—12 × 10 in.
For 200, 216, 226—10 × 8 in.

In order to make the packing as simple as possible, it is well to take a piece of cardboard the exact size of the bottom of the box and mark it out in circles as in the diagram, only in full size. This shows the packer at a glance just where to put each fruit in the first layer. By turning the cardboard around from right to left the second layer is indicated, and so on. No packing material such as wood wool or paper shaving should be used.

The fruit must be packed firmly in the box and covers nailed on carefully. If properly packed, in nearly all cases the fruit in the top layer will stand well up over the sides of the box. This means that after nailing down there is bulge in the middle of the box, necessitating that all boxes must stand on their ends during shipment.

The boxes must be plainly marked with the grower's brand if he has adopted one. If this has not been done his name must appear on one end of the box, together with number and variety of contents and the consignee's brand on the other. This is usually reduced to three letters in a triangle or circle, thus



Nartjes are packed in shallow boxes or trays 18 × 12 × 2¼, 2½, or 2¾, depending on the size of the fruit. They are sorted for size by the eye, as machines have not proved satisfactory. Wrapping is just the same as with the orange. The packing should be as firm as possible, and on no account should the fruit be packed so loosely as to shake about in the box; a little lace paper added round the inside of the top of the box improves the appearance.

It is not advisable to send small sizes, and in all cases tight skinned kinds only should be sent. The darker the colour the better.

These small boxes may be strapped together in bundles of four and branded as advised in the case of oranges.

Cleats should be nailed over the ends of the covers of the lower three boxes in the bundle, thus allowing a certain amount of ventilation.

They may also be packed in cases 26 × 12 × 6¾ outside measurement. This allows an average pack of about 138 fruits, depending on the size, and in the writer's opinion this particular box is likely to prove of advantage in extending the business in this fruit.

The above notes are somewhat concise owing to lack of time, but full particulars on any points not made clear will be supplied on application to the Agricultural Department, Pretoria.

Codling Moth.

THE NEW REGULATIONS RESTRICTING FRUIT TRAFFIC.

I.

THE attention of fruit shippers and others is drawn to the prohibition which has been imposed by Union Government Notice No. 321, dated 18th February, 1911, on the introduction into certain districts of the Transvaal of apples, pears, and quinces in their fresh state. The prohibition extends to boxes and other receptacles which have contained any such fruits, and an infringement is liable to lead to the confiscation of the articles concerned as well as to a prosecution. The object is to check the spread of the codling moth pest. Similar Government Notices, which will apply to certain parts of the Orange Free State and Natal, will shortly be published.

The protected territory of the Transvaal consists of the Districts of Marico, Lichtenburg, Wolmaransstad, Potchefstroom, Heidelberg, Standerton, Bethal, Carolina, Ermelo, Wakkerstroom, Piet Retief, and Lydenburg, the Wards Zwart Ruggens and High Veld in the District of Rustenburg, and the Ward Witwatersberg in the Witwatersrand area. The territory of the Orange Free State which is to be protected consists of the Districts of Vredefort, Heilbron, Frankfort, Vrede, and Harrismith; and that of Natal of the Counties of Utrecht, Vryheid, Klip River, Weenen, Umvoti, Pietermaritzburg (exclusive of the Magisterial Divisions of Umgeni and Camperdown), Alfred (exclusive of such part as lies in the Magisterial Division of Lower Umzimkulu), and the Magisterial Division of Nqutu, in Zululand. Altogether the whole territory protected and to be protected is an irregular but undivided block of country in the high veld of the Transvaal, Orange Free State, and Natal. The territory does not include any important markets for apples, pears, and quinces grown at a distance, and no part of it is known to be infested by the codling moth. Within it are all railway stations between Roodewal, Orange Free State, and Natal Spruit, Transvaal, on the Cape main line; Kingswood, Transvaal, and Bank, Transvaal, on the Fourteen Streams line; Hilton Road, Natal, and Roodekop, Transvaal, on the Natal main line; and Godwan River, Transvaal, to Wonderfontein, Transvaal, on the Delagoa Bay main line; and also those in the Transvaal Province south of Lawley on the Johannesburg-Viljoens Drift branch, east of Largo on the Johannesburg-Machadodorp, via Breyten, branch, west of Krugersdorp on the Zeerust branch, and all on the Ventersdorp, Ermelo, and Lydenburg branches; those in the Orange Free State on the Parys and Heilbron branches; those east of Kestell Road, Orange Free State, on the Ladysmith-Harrismith line; and those in Natal south of Elands Kop on the Maritzburg-Malenge Valley branch, north of Albert Falls on the Greytown branch, and all on the Utrecht, Vryheid, Weenen, Upper Tugela, Stuartstown Narrow Gauge, and Richmond branches.

Amongst the places which are not in the protected territory of the Transvaal are Johannesburg, Germiston, Boksburg, and all other

places in the Witwatersrand area from and including Krugersdorp to and including Springs; also Pretoria, Rustenburg, Pietersburg, and Middelburg and all stations on the direct lines of railway connecting these several points with Johannesburg; also Christiana and Bloemhof in the south-west of the Province and Barberton in the south-east. Amongst the Orange Free State centres which will not be protected are Bloemfontein and Kroonstad, and all stations between these points and from them to and including Bethlehem, and all on main and branch lines south and west of Bloemfontein. Amongst those of Natal which will be left open are Durban and Pietermaritzburg and all between those points and all on the North Coast and South Coast lines.

The regulations with respect to the part of the area lying within the Transvaal are now in force by virtue of Government Notice No. 321 of 18th February, 1911, above noted; and the restrictions on the introduction of fruit, boxes, etc., into this part from places outside of the area apply equally to traffic originating in the parts of the area lying in the Orange Free State and Natal until the regulations have actually been gazetted with respect to those Provinces. Similarly traffic between all parts of the Union and all parts of the Orange Free State and Natal can for the present continue without reference to the new restrictions. The introduction of fruit into the Orange Free State from other parts of the Union has not been subject to special regulations. The introduction of apples, pears, and quinces into Natal, however, is still subject to the conditions specified in Natal Proclamation No. 58 of 1908, modified by Proclamation No. 57 of 1909. The former Proclamation requires that a special permit to introduce the fruits specified be secured from the Government Entomologist, Pietermaritzburg, and the latter Proclamation exempts consignments from stations in the codling moth protected area of the eastern part of the Cape Province from this requirement. In anticipation of the substitution of the new regulations for the standing ones, the Natal Entomologist will refuse applications to admit consignments into the parts of Natal which it is proposed to close from places not within the area closed or to be closed, while he will grant applications as freely as the regulations allow to admit consignments to Pietermaritzburg and Durban and other places in the area it is proposed to have open.

It is anticipated that the three sets of regulations, that is the sets now necessarily being published independently for the Transvaal, Orange Free State, and Natal, will be brought together and republished as one under the authority of the Union Agricultural Pests Bill when that measure is passed by Parliament. It is quite possible that the boundaries of the area will be slightly modified if republication takes place, and interested parties are cautioned to be on the watch for changes and to amend this explanatory notice accordingly. The position with regard to large towns is not likely to be altered.

II.

With the object of checking the spread of codling moth into supposedly clean districts of the Transvaal, where the culture of the fruits affected by this pest is or promises to be of importance, the Government, by Union Government Notice No. 321 of 18th February, 1911, has restricted the introduction of apples, pears, and quinces in

their fresh state, and of all boxes and other receptacles that have contained such fruits, into a large section of the Transvaal. The protected region consists of the Districts of Marico, Lichtenburg, Wolmaransstad, Potchefstroom, Heidelberg, Standerton, Bethal, Carolina, Ermelo, Wakkerstroom, Piet Retief, and Lydenburg, the Wards Zwart Ruggens and High Veld in the District of Rustenburg, and the Ward Witwatersberg in the Witwatersrand area.

Traffic in supposedly codling moth free apples, pears, and quinces is being allowed to continue as before between any two points within the area, and from any point within to any point without, but traffic in these fruits and in boxes, etc., that have contained such fruits from any point outside of the area to any point within it is being prohibited save with respect to consignments from Griqualand East for Natal. The prohibition will be held to apply to boxes, etc., in which the fruits mentioned have been sent to places outside of the protected area, e.g. Johannesburg, and which it might be desired by the shipper to have brought in again as "returned empties". The sale or removal within the protected area of any fruit infected by the codling moth is prohibited, as is also the removal of any living specimen of the insect, except that infested fruit and specimens of the insect may be dispatched to the Government Entomologist of the Province in which such may be found for his examination.

The effectiveness of these measures in retarding the introduction and spread of the codling moth will depend to a very great extent on the alertness of parties within the region in detecting and reporting infringements. In its destructive stage the insect is a flesh-coloured or pinkish, practically hairless, dark headed caterpillar, which when full grown is about five-eighths of an inch long. It tunnels in definite channels through the fruit, usually from the blossom end or from a point of contact with another fruit or other body, and a mass of brownish pellets of rejected matter generally projects from the burrow. The dark head, definite legs, and ability to spin a silken thread readily distinguishes it from the headless and legless fruit-fly maggot that is often found in numbers in fruits of various kinds. Any party who may discover codling moth in any orchard, garden, market, shop, or other place in the protected area is earnestly requested to report the matter at once to the local police or, what is better, to the local Magistrate. Similarly any introduction of apple, pear, or quince fruits from outside the area should be reported without delay.

The co-operation of fruit growers, fruit dealers, market agents, and market masters with Government officials in rendering the regulations effective is specially desired. Where it gets thoroughly established the pest may attack and destroy, or seriously injure, nearly every apple and pear if the troublesome measure of thoroughly spraying the trees with an arsenical poison is not practised. Specialists in fruit culture who have experience with the pest do not, as a rule, find it a grave obstacle to success in their business, since they are easily able to employ remedies in the most approved manner; but parties to whom fruit growing is subordinate to other interests, especially those who have high trees, are apt to deem remedies too laborious for their adoption or to employ them in an inefficient manner. Many would rather sacrifice their trees than to take the trouble to combat the pest. The parent moth is able to fly several miles, and

hence the pest tends to spread over the country, but the spread from place to place is chiefly effected by means of infected fruit or fruit boxes in which the insect has secreted itself.

Fruit growers resident in the closed areas should bear in mind that these regulations are imposed for their special benefit, that is, to retard the spread of the pest to their orchards, and it is expected that in self-interest they do all in their power to render the regulations effective. They themselves will be liable to the full penalty provided if they allow any codling moth affected fruits to be removed from their premises, and likewise if they bring back to their premises any boxes or bags, new or old, in which apples, pears, or quinces have been sent to any point outside of the closed area, and this is true whether the articles are brought back by train or wagon. Fruit that accompanies passengers by train, whether in the luggage van or not, and fruit carried by cart or wagon, is subject to the restrictions equally with fruit consigned by goods train.

Residents on uninfested farms in parts of the country where unrestricted traffic in apples, etc., is being allowed to continue are advised strongly to avoid bringing any infested fruit or old fruit boxes on to their farms. It is considered impracticable to help them to protect themselves by Government regulations, but their own vigilance may long serve to keep the insect away. Apples, pears, or quinces from any place should be regarded with suspicion, and in this connection it may with advantage be mentioned that the pest is thoroughly established around Johannesburg, and is present in many gardens at Pretoria. The old apple or pear box is more dangerous than fruit, as a rule, and there is a considerable risk with any box that has stood near infested fruit, whether during a train journey or at a produce merchant's or elsewhere.

As stated in the first paragraph, the regulations for the Transvaal, Orange Free State, and Natal will be on the same lines. The Transvaal schedule is as follows:—

No. 321.] [18th February, 1911.

His Excellency the Governor-General-in-Council has been pleased to approve of the following regulations framed under the provisions of section *one* of the Diseases of Plants Prevention Ordinance, 1904 (Transvaal):—

1. The introduction into the undermentioned areas in the Province of the Transvaal, namely, the Districts of Marico, Lichtenburg, Wolmaransstad, Potchefstroom, Heidelberg, Standerton, Bethal, Carolina, Ermelo, Wakkerstroom, Piet Retief, and Lydenburg, the Wards Zwart Ruggens and High Veld, in the District of Rustenburg, and the Ward Witwatersberg in the Witwatersrand area, by any means and for any purposes whatsoever of any living egg, larva, pupa, or imago of the codling moth insect or of apple, pear, or quince fruits in their fresh state or of receptacles in which any such fruit has been carried shall be and is hereby absolutely prohibited, save, however, that this prohibition shall not apply to (*a*) fruit and other articles from territory of the Orange Free State and Natal Provinces which is contiguous to the defined territory of the Transvaal, and into which the introduction of such fruit and other articles is similarly prohibited; (*b*) consignments which enter the said areas in through transit by rail or post to points beyond; (*c*) consignments by rail or

post from any one point to any other point within the said areas which in transit pass through territory not included within the areas.

2. No person, not acting under instructions of the Government Entomologist, shall knowingly remove or cause to be removed any living egg, larva, pupa, or imago of the codling moth, or any fruit of any kind which contains or has contained any stage of the said insect, from any place in the areas defined in regulation *one* to any other place in the said areas, or from any place outside of the said areas to any place within them, and no person shall knowingly expose or offer for sale or keep in stock for sale, sell, or cause to be sold within the said areas any fruit of any kind which is or has been infested by the said insect; provided, however, that it shall be lawful for any person in the areas defined in regulation *one* to dispatch specimens of the codling moth in any stage and, likewise, fruit infested by the said insect, to the Government Entomologist, Pretoria, for examination.

3. Any insect, fruit, or receptacle introduced into any area defined in regulation *one* in contravention thereof, and any insect or fruit removed from one place to another, or any fruit exposed or offered or kept in stock for sale in contravention of these regulations, shall be liable to confiscation and destruction, and any person responsible for the contravention shall be liable, on conviction, to a fine not exceeding fifty pounds, or, in default of payment, to imprisonment, with or without hard labour, for any period not exceeding three months.

Analysis of Prize Cape Wines, Brandies, and Van der Hum.

Report on the analysis of samples of pure Cape Wines submitted by the Secretary of the Western Province Board of Horticulture (Capetown) in connection with the Wine Show held under the auspices of that body on August 17th last and referred for analysis by the Acting Under-Secretary for Agriculture (Cape). The following are the analytical results :—

Class.	No.	Description of Sample.	Prize.	Alcohol by Volume.	Proof Spirit.	Extract.	Total acid as Tartaric.	Volatile acid as Acetic.	Sulphurous oxide milligrammes.
				%	%	%	%	Per mille.	Per litre.
I.		*Hock Type* :							
	1	Philip Rabie ..	1st	11·96	20·96	1·734	·649	·424	98
	2	Drostdy Co-operative Winery	2nd	12·05	21·11	2·137	·692	·487	237
II.		*Sauterne* :							
	3	Drostdy Co-operative Winery	2nd	13·43	23·54	2·198	·681	·734	277
III.		*Sherry* :							
	4	P. J. P. Cillie ..	2nd	12·22	21·42	2·426	·508	·838	2[illegible]0
V.		*Sweet White Wine*:							
	5	Philip Rabie ..	1st	16·05	28·13	28·578	·508	·208	18
VI.		*Stein* :							
	6	Drostdy Co-operative Winery	2nd	12·96	22·71	2·325	·638	·502	82
VII.		*Green Grape* :							
	7	E. Lange ..	1st	13·15	23·04	2·401	·550	·570	92
	8	H. Bowyer ..	2nd	15·49	27·15	2·390	·649	·596	100
VIII.		*White French* :							
	9	Philip Rabie ..	1st	11·52	20·19	1·815	·583	·347	93
	10	Alphen Winery	2nd	11·79	20·65	1·652	·627	·467	39
	11	Drostdy Co-operative Winery	3rd	11·79	20·65	2·063	·724	·424	79
IX.		*White Wine (A.O.V.)* :							
	12	Alphen Winery	1st	11·26	19·75	1·945	·819	·294	28
	13	Philip Rabie ..	1st	12·58	22·06	2·182	·637	·562	156
	14	Klein Constantia Estate	2nd	13·52	23·70	2·177	·810	·311	87
X.		*Claret* :							
	15	E. Lange ..	1st	10·65	18·65	2·447	·518	·527	Nil.
	16	Rudolphe Cloete	2nd	11·61	20·35	2·194	·550	·864	”
	17	Louis Cloete ..	3rd	11·52	20·19	2·165	·518	·691	”
XI.		*Burgundy* :							
	18	F. F. Versfeld ..	1st	12·77	22·39	2·606	·518	·734	”
	19	O. Rathfelder ..	1st	13·15	23·04	2·570	·540	·622	”
	20	Louis Cloete ..	2nd	12·49	21·89	2·360	·526	·674	”
	21	Alphen Winery	3rd	12·40	21·73	2·387	·562	·708	”
XII.		*Heavy Dry Wine*:							
	22	Drostdy Co-operative Winery	1st	18·68	32·73	3·260	·562	·847	”
	23	G. A. Retief ..	2nd	18·68	32·73	4·616	·459	1·140	33
XIII.		*Heavy Sweetish Wine* :							
	24	G. A. Retief ..	2nd	19·87	34·82	5·206	·475	·795	60
XIV.		*Sweet Red Wine* :							
	25	P. J. Rabie ..	1st	15·86	27·81	27·608	·518	·189	Nil.

ANALYSIS OF PRIZE CAPE WINES, BRANDIES, AND VAN DER HUM—(*continued*).

Class.	No.	Description of Sample.	Prize.	Alcohol by Volume.	Proof Spirit.	Extract.	Total acid as Tartaric.	Volatile acid as Acetic.	Sulphurous oxide milligrammes.
				%	%	%	%	Per mille.	Per litre.
XV.		*Hermitage*:							
	26	O. Rathfelder ..	1st	12·31	21·57	2·175	·529	·617	,,
	27	J. A. Brink ..	2nd	12·31	21·57	2·484	·572	·484	19
	28	Hohenort Estate	3rd	13·05	22·88	2·202	·562	·562	25
XVI.		*Cabernet*:							
	29	J. A. Brink ..	1st	12·49	21·89	2·660	·508	·461	Nil.
	30	O. Rathfelder ..	2nd	12·96	22·71	2·592	·550	·490	,,
	31	F. F. Versfeld ..	3rd	12·77	22·38	2·507	·518	·518	,,
XVII.		*Pontac*:							
	32	G. A. Retief ..	1st	18·78	32·91	5·851	·454	·976	46
	33	Philip Rabie ..	2nd	16·89	29·60	2·331	·540	·576	35
XVIII.		*A.O.V.Red Wine*:							
	34	J. A. Brink ..	1st	10·65	18·65	11·073	·529	·639	Nil.
XXII.		*Geripieco*:							
	35	Philip Rabie ..	1st	16·24	28·46	33·721	·648	·225	16
XXIV.		*Jagger Cup*:							
	36	Philip Rabie ..	1st	12·05	21·11	1·790	·600	·403	92
XXV.		*Merchant's Cup*:							
	37	O. Rathfelder ..	1st	12·87	22·55	2·607	·508	·532	Nil.

Capetown, 27th September.

(Sgd.) JOHN G. ROSE,
Analyst.

ANALYSIS OF VAN DER HUM AND PURE WINE BRANDY.

Report on the analysis of a sample of Van der Hum and a sample of Pure Wine Brandy submitted by the Secretary of the Western Province Board of Horticulture (Capetown) in connection with the Wine Show held under the auspices of that body on the 17th August last, and referred for analysis by the Acting Under-Secretary for Agriculture (Cape).

The following are the analytical results:—

	Van der Hum. Class 20.	Pure Wine Brandy. Class 19.
Extract	42·881	·054
Alcohol volume percentage	37·90	58·83
Proof spirit	66·43	97·85
In grammes per 100 litres absolute alcohol.		
Higher alcohols	—	172·00
Ethers	—	171·50
Aldehydes	—	22·20
Furfural	—	·96

(Sgd.) JOHN G. ROSE,
Analyst.

The Acting Under-Secretary for Agriculture,
Capetown.

Transmitted.
(Sgd.) CHAS. F. JURITZ,
Senior Analyst.

Household Science.

THE GROWTH OF SYSTEMATIC TRAINING IN DOMESTIC SCIENCE.

By Miss MABEL L. HOOPER, L.C.A., Principal, Government Cookery School, Pretoria.

AT the present time, when the interest of the women of the Transvaal is centred on the proposed School of Domestic Science, I think it would not come amiss to give a short description of the National Training School of Cookery and Domestic Science, London, and the methods of carrying on the work there.

First, I must give a description of this institution, which was established at South Kensington in March, 1874, and was the pioneer school of domestic subjects. It was inaugurated at the suggestion of Sir Henry Cole, K.L.B., with the object of promoting a knowledge of cookery among all classes of the community. Within a year of the opening of the school, classes were commenced for training students to be teachers of cookery, and diplomas were issued by the committee.

The committee of the school then prevailed upon the education authorities to introduce cookery as a class subject in elementary schools, and also to encourage such teaching in training colleges. Their representations were successful, and a grant of public money was made to carry this out.

In 1876 the executive committee made further representations, and pointed out that the National Training School was the only institution for supplying competent teachers to give effect to the wise introduction of cookery into the code as a branch of domestic economy in elementary schools, and, as a result, schools of cookery were started in the provinces, the teachers having all been trained at the National Training School of Cookery. In this way the work was started and has spread steadily all over the United Kingdom, to America, and to the British Colonies.

In the year 1883 the committee were requested by the Council of the Fisheries Exhibition to undertake the management of a cheap fish dining-room at the exhibition. The request was complied with, and dinners were provided at a tariff of 1s. and 6d. each.

The result was so successful that the arrangement was continued through each of the succeeding exhibitions, viz., the Health, Inventions, Colonial, and Indian Exhibitions, with a resulting profit to the school of £5000, and without in any way disturbing the normal work of the school itself.

In 1889 the school premises in South Kensington became too congested, and, aided by a grant of £5000 from the Berridge Trustees, combined with the exhibition profits, the present commodious premises in Buckingham Palace Road were erected.

The larger premises enabled the scope of the school to be extended, and classes were then held in other branches of domestic science, such as needlework, dressmaking, millinery, laundry, housewifery, and household management.

This brief résumé serves to illustrate the rapid development of the school; the necessity for the undertaking may be judged by its immediate success, as, with the exception of the grant of £5000, which was appropriated for building purposes, the institution has been entirely self-supporting.

I now propose to illustrate the far-reaching scope of the operations of the school.

Instruction is imparted to all classes from elementary school children to adult members of the community. A list of these classes would, I think, be instructive.

Teachers are sent to various schools in London to give lessons in all domestic subjects.

Classes of the Queen's Jubilee Nurses are given a course of lessons in sick-room cookery regularly twice a year. A teacher takes cookery classes twice a week at Guy's Hospital.

A teacher is engaged by the Admiralty and attends four times a year for a three weeks' course at Haslar Hospital and the R.N. Hospital, Plymouth, to teach cookery to the non-commissioned officers and men. The Admiralty also sends relays of paymasters to the school to be practically instructed in cookery, and the War Office sends a certain number of the Royal Army Medical Corps to be trained. The Shipping Federation also sends ships' cooks to be trained to instruct cooks for the mercantile marine.

In addition to practical instructions of this very far-reaching nature, the school authorities have been consulted by the War Office in connection with the commencement of a school of cookery at Aldershot; the advice of the school authorities was sought on the particular recommendation of Sir Evelyn Wood.

The school has been consulted by the Government on the subject of workhouse diet; it inspects the cooking at some of H.M.'s prisons, and reports on the work done by prison cooks.

Sufficient has, I think, been said to show how recent is the development of scientific instruction in domestic subjects, and how valuable such instruction is may be judged by the rapid progress of the pioneer school of instruction and by the ready manner in which the central and local authorities in England have availed themselves of its advance and assistance.

RECIPES FOR THE FARM HOME.

WELSH CHEESE CAKES.

Ingredients: scraps of pastry, jam, 1 egg, its weight in sugar, flour and butter, grated lemon rind.

Method.—Roll out the pastry and line some flat tartlet tins with it. Put a very little jam in each. Beat the butter and sugar together, add the egg, and beat well. Work in the flour and lemon rind lightly. Put about 1 teaspoonful of this mixture over the jam; bake in a quick oven for ten minutes.

VEGETABLE MARROW STUFFED.

Ingredients: *1 marrow, 2 oz. cold meat, 1 oz. breadcrumbs, 1 teaspoonful chopped parsley or mixed herbs, a little gravy or milk, seasoning.*

Method.—Peel the marrow, cut in half lengthways and remove the seeds. Soak the breadcrumbs in the gravy or milk. Mince the meat, mix with the breadcrumbs, herbs, and seasoning. Fill each half of the marrow with this mixture and tie together. The marrow can either be steamed and served with white sauce or baked and served with brown sauce. If baked, mix a little flour, pepper, and salt, and shake over it and baste with dripping. It will take about an hour to cook.

* * * *

RICE CUTLETS.

Ingredients: *¼ lb. cooked rice, 1 small onion, 2 oz. breadcrumbs, ½ lb. cold meat, ¼ lb. suet, seasoning.*

Method.—Boil the onion and chop it. Chop the meat and suet very finely and mix with the rice, breadcrumbs, and onion. Season well with salt and cayenne pepper. Moisten with a little gravy or milk and cook for a few minutes to make it bind. Make into flat round cakes, egg and breadcrumb, and fry a golden brown.

Sufficient for sixteen cutlets.

* * * *

RASPBERRY BUNS.

Ingredients: *½ lb. of flour, 1 teaspoonful cream of tartar, ½ teaspoonful carbonate of soda, 2 oz. butter, 2 oz. sugar, 1 egg, raspberry jam.*

Method.—Mix the flour, cream of tartar, and soda together; rub in the butter and add the sugar. Mix with well beaten egg. If too stiff add sufficient milk to make into a soft dough. Divide into ten pieces, place a little jam in the centre, fold together, and pinch the edges. Bake from ten to fifteen minutes.

CONTRIBUTORS' COLUMN.

MEALIE MEAL PANCAKES.

Ingredients: *½ cup of meal fine, ½ teaspoonful salt, 2 eggs, 1 pint milk.*

Mix mealie meal, salt, eggs, and milk to a smooth batter, stand to one side for an hour, then fry as usual. Pancakes served hot with sugar and lemon or jam.

* * * *

SAVOURY DISH.

Ingredients: *6 oz. of mealie meal, 4 oz. of cheese, pepper and salt to taste, 1 oz. of butter, 2 tablespoonfuls of milk.*

Boil mealie meal rather stiff; when cooked turn out. Grate 4 oz. of cheese, put meal and cheese in layers in pie-dish with pepper and salt, allowing the mealie meal to be the last layer on top; then sprinkle milk over, put butter in little balls on top. Put in a hot oven; bake until light brown. Serve while hot.

MEALIE MEAL PUDDING.

Ingredients: *6 oz. mealie meal, not too fine, 4 oz. of sugar, 3 eggs, little salt, little nutmeg.*

Cook meal in milk with the salt; when cooked turn out into a basin. When a little cool, mix in 3 yolks of eggs and the white of 1 egg, 2 oz. sugar and nutmeg, and 1 cup of milk. Beat well together, put into a shape that has been well greased. Bake in a slow oven until the eggs are set. When cooked take out of the oven, turn out, let stand to cool. Take the two remaining whites of the eggs, beat into a stiff froth. Now take the remaining 2 oz. of sugar, beat up with the whites of the eggs, add a little lemon flavouring. Cover pudding all over. Put in a warm oven to get firm. When a little firm take out and put in a cool place.

SAUCE FOR THE ABOVE PUDDING.

Boiled custard with lemon flavouring. Serve cold.

MEALIE MEAL SHORTBREAD.

Ingredients: *8 oz. very fine meal, 3 oz. butter, 3 oz. sugar, pinch of salt, teaspoonful ground ginger, 2 eggs, teaspoonful baking powder.*

Put butter into basin on the stove to melt. Mix meal, sugar, powder, salt, and ginger. Last of all put in the hot butter; knead well with the hands. Flour your pasteboard and roll out in cakes, pinch edge with fingers. Bake until a very light brown.

CARAMEL PUDDING.

Ingredients: *3 eggs, 1 pint milk, sugar to taste, flavouring, cinnamon, 1 oz. sugar.*

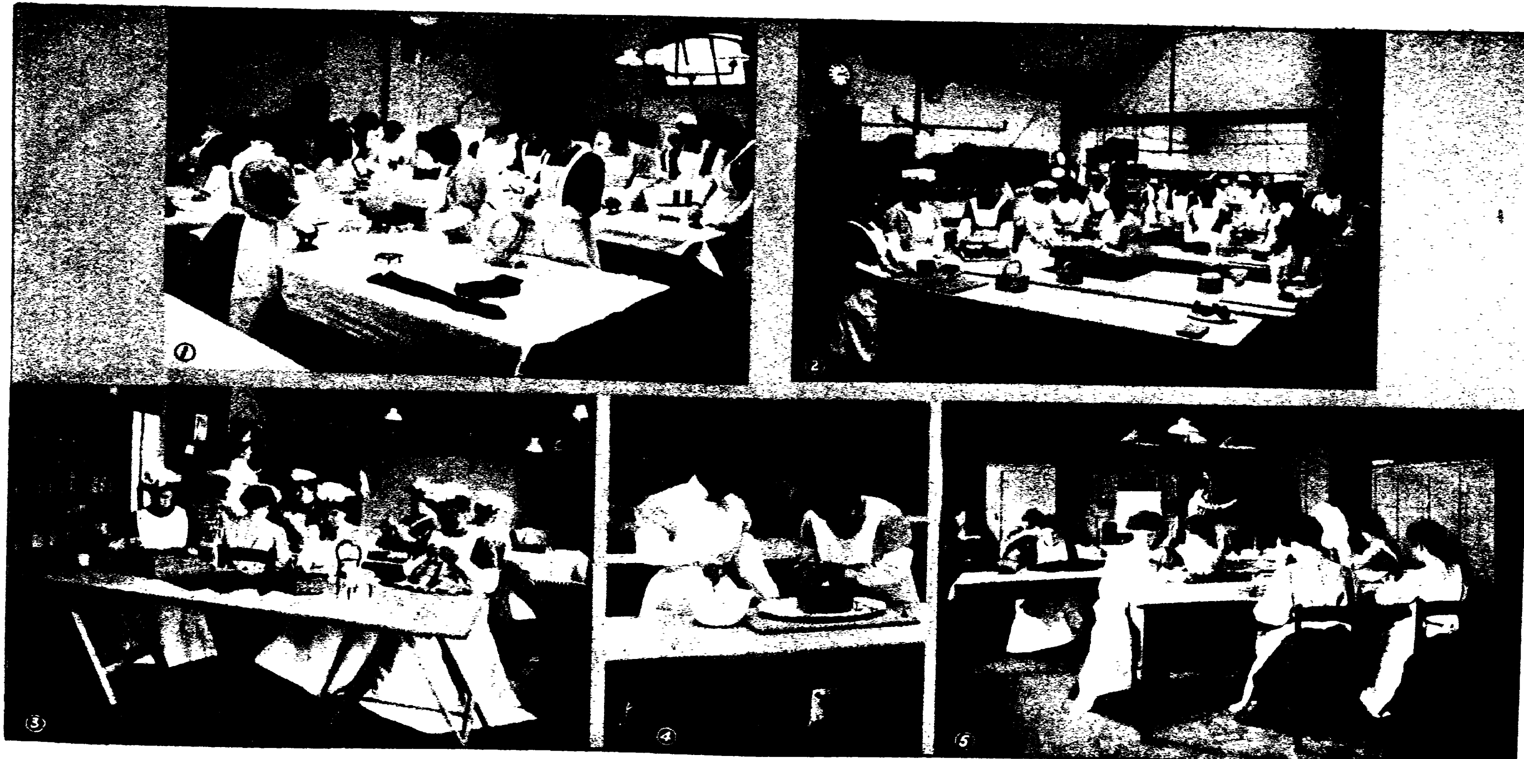
Put into mould on stove until it gets a very dark brown; then strew sugar around the mould. When dry it should be like hard toffee. Mix three eggs, one pint milk, sugar, and cinnamon. Put into mould. Tie down, steam for one and a half hours. When cold turn out into glass dish when you will find a rich brown sauce.

MERINGUES SWEET.

Ingredients: *½ lb. pounded white sugar, the whites of 4 eggs, 1 pint cream, flavouring vanilla.*

Whisk the whites of the eggs to a stiff froth, then stir in the sugar before the froth goes down. Have some boards thick enough to prevent the meringues from browning when baked on them, put in the oven, cut some strips of white paper and lay on the boards. On this drop a tablespoonful at a time of the beaten egg and sugar, dropping it in the form of the spoon with some two inches of space between. Strew over a little sifted sugar. Bake for half-hour in a moderate oven. As soon as they begin to colour take them out. Take each slip of paper by the two ends and turn the meringues on to a board; remove the soft part with a wooden spoon. Put some fresh paper on the board, lay the meringues upside down, replace in oven

Househo Science



(1) Laundry Classroom: Students Ironing.
(2) Cookery Classroom: Students at Work.
(3) Housewifery Classroom: Students Learning Upholstery.
(4) Cookery Classroom: Icing Cakes.
(5) Needlework and Dressmaking Classroom.

to harden. Whip the cream slightly, flavour with vanilla, then fill the meringues when cold with this. Put two together so as to take the form of an egg.

The meringues must be put into the oven directly they are dropped upon the board or they will lose their shape. They can be kept in a dry place for some time, and can be filled with cream when required. Time to bake half an hour.

MEALIE BANNOCKS.

Ingredients: Mealie meal fine, salt to taste.

Boil your meal quite stiff, then put out to cool. Rub the top of your stove well, then make your meal into little balls and flatten out on the stove; when brown turn over and brown the other side. Butter and put into the oven. I have found them to be very nice.—MRS. TODD, Logie Farm, White River, Barberton District.

Cynara scolymus (Globe Artichoke).

Use the flower while it is quite young, as it is more tender and sweet, and the "choke" or "thistle" in the middle is still soft. The elder flower can be used, but the thistle part must be carefully lifted from the centre or heart after it is cooked, as it is very disagreeable to get it into the mouth.

The flower is generally prepared in the following way: Cut the flower with a short stem, remove the lowest outside leaves or bracts, and, after washing well by holding it head down and dipping it into cold water, put it into boiling water with a little salt. Boil gently, without removing the cover of pan, for about twenty minutes or half an hour. When done the leaves will pull off easily. Drain well when done and serve at once. The base of each leaf is eaten, also the "cushion" under the "choke" or thistle. This cushion is called the "heart" of the artichoke, and is considered a great delicacy.

A sauce of butter, melted, mixed with salt, pepper, and vinegar, or a salad dressing, with salad oil and vinegar and salt, is often used. Dip each leaf into the sauce, and cut the heart into small pieces and dip into the sauce. The leaves are eaten with the fingers.

Artichoke fritters are good. Cut the cooked hearts into dice. Put a tablespoonful of butter into a saucepan, add two cups of the diced artichokes, half a pint (one cup) of milk, a little parsley, salt, pepper, and the beaten yolks of two eggs. Stir till the sauce thickens, then remove and add one tablespoonful of lemon juice. Make a rich paste, roll very thin, and cut out with a round cutter. One round is covered with another, a tablespoonful of the artichoke between, the edges pressed well together. Fry in smoking hot fat till a golden brown. Serve at once with a garnish of fresh parsley.

Artichoke hearts may be broiled or roasted to serve with lamb chops or any young lamb.

Artichoke omelet is good for breakfast or for luncheon.

Artichoke salad made from the hearts is much liked.—ALICE BURTT-DAVY.

HOUSEHOLD HINTS.

Enamel saucepans are expensive things to use if they are not properly cleaned, as they soon chip and become unfit to use. After use they should be filled with cold water and allowed to soak for an hour; then rub thoroughly with a cloth dipped in fine ashes, salt, or crushed egg shells. Rinse with hot water and dry.

* * * *

Aluminium saucepans should be rubbed with powdered bathbrick after being washed. If the saucepan is not very stained, soap and water is sufficient. Soda should never be used for aluminium.

A cloth wrung out in vinegar and wrapped round cheese will keep it from getting mouldy.

* * * *

To prevent straw-matting from turning yellow, wash it with salt and water.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

A MERINO SHEEP SHOW.

To the EDITOR, *Agricultural Journal*.

Sir,—I would like to ask those interested whether the time has not come to hold an annual show for merino sheep only in the coldest season of the year, say, July. Merino wool is our largest industry outside gold and diamonds, and a show such as I suggest would gather together the breeders and sheep of the Union. The whole accommodation of a large showyard would be available, and the sheep might be classified according to districts, with the result that the most favoured districts would not have it all their own way. A series of lectures by an expert and discussions by the breeders present would enormously advance the industry.—Yours, etc.,

R. PELL EDMONDS.

Ripplemead, Dohne, Cape Province, 28th January, 1911.

COTTON IN THE TRANSVAAL.

To the EDITOR, *Agricultural Journal*.

Sir,—We have read with great interest the article on cotton in the February number of the *Agricultural Journal*, page 58, and we thought the following might be of interest.

We believe that we were the first to experiment with the cultivation of cotton, at all events in the Eastern Transvaal. Captain Elphick, who thoroughly understands this branch of agriculture, started our experiments in this direction in September, 1903, at our trial ground by planting some six different distinct varieties of cotton, and since that time we have been steadily advancing. We have now discarded all varieties except the Upland American, as we found (1) that the Indian was too small in boll and yield; (2) the Sea Island, although it grew and yielded fairly well, we could not grow as a commercial success; (3) the Egyptian was too delicate and prone to insect pests. The latter grew very luxuriantly, and at times yielded splendid crops, but when our insects got hold of it a few days saw the ruin of whole fields. We lost ten acres one season in four days.

We consider that cotton is one of the best and safest crops to grow in this part of the Transvaal, i.e. low veld. We are 1190 feet above sea-level and 90 miles from the coast; our rainfall this season,

i.e. from June last to the present time, has been just over nine inches, but our cotton fields are looking splendid, and this without irrigation, while mealies, except where they have had water, are dried up and finished. We having now found our best variety of cotton intend to devote our farming to this branch of agriculture, and to this end we have already erected ginning plant and baling presses operated by steam, and we hope to make this a centre for the ginning, baling, and marketing of any raw cotton that our neighbours care to send us. Our charges are for receiving the raw cotton at railway station, ginning, baling, and putting same on rail, one penny per lb. of cotton lint. This includes baling, cloth and bands, marking, etc. If our customers desire it, we will forward the bales to England and dispose of it to the best advantage, deducting our commission and cost of freight, etc., from the proceeds of sale. We intend shortly to erect oil mills to deal with the cotton seed in a small way at first, but with a view to extension. We shall thus be able to make the best possible value of the seed both for ourselves and our customers, and the cotton-seed cake will form a splendid cattle food. As is well known, the manure from animals fed on cotton-seed cake is one of the richest.

We notice in the value of cotton crop given on page 59 the cost of picking 1000 lb. cotton is given as 10s. This seems to us to be very small. Our actual cost works out very much higher when we employ adult labour (native). We find that a native will pick about 40 lb., and his wages here are 1s. per day, his food costing about 6d. We also find no item given for ginning. This should be put down at 1d. per lb. of lint; freight to England, ½d. per lb., plus 10 per cent. primage; and, say, 15 per cent. for commission, brokerage, etc.

We shall at all times be pleased to answer any inquiries by intending growers, and shall be pleased at any time to show any one over our estate so that they may see for themselves the best agricultural implements to use in the low bushveld and methods of planting, etc. We may say that had we have had a chance of seeing the best ploughs, etc., at work before we started it would have saved us many pounds sterling and a lot of time lost.—Yours, etc.,

G. J. ELPHICK & CO.

Malelane Estate, Eastern Transvaal, 20th February.

THE MARTIN AS A LOCUST DESTROYER.

To the EDITOR, *Agricultural Journal.*

Sir,—The destruction of locusts has often been discussed and written about in various Cape papers, but the other day I read in a book of travels that the people of Mauritius some years ago introduced a bird they called the martin, a species of starling (*Pastortristis* or *Cristalellus*), for the destruction of locusts, and which it has successfully performed. It has also destroyed other insects. It would be a good thing if this bird could be introduced into the Cape Province and South Africa generally, and a law proclaimed to prevent their being shot.—Yours, etc.,

AGRICULTURIST.

Sidmonth, Devon, England, 24th January.

ABNORMAL OSTRICH EGGS.

To the EDITOR, *Agricultural Journal.*

Sir,—*Re* the twin ostrich chicks out of one egg at Mr. Carel Hagenbeck's Zoological Park, Stellingen, near Hamburg, Germany, I may tell the general public that I, the undersigned, personally got twin ostrich chicks the very same way as those of Mr. Carel Hagenbeck's referred to. I brought the egg out of a veld camp; the egg was not an exceptionally big one, but of a large size. The majority of the eggs were hatched, and, being in the veld, I took the hatched chicks with some eggs home, as we generally did and still do when breeding takes place in the veld. The birds came out quite well, and properly developed, only with a fairly thin string attaching them.

This occurrence is, therefore, not new to me, having happened in South Africa.—Yours, etc.,

J. C. SOOCK.

Warmbad, Uniondale.

SPONSZIEKTE OR QUARTER EVIL.

To the EDITOR, *Agricultural Journal.*

Sir,—I have a good remedy against quarter evil, which I can recommend to your readers.

I have tried everything, even vacine, but without success, until a prominent cattle farmer advised me to use salt water, as strong as a calf could take it, to be repeated after a week. I then put a tub in the camp of my calves, which I keep filled with salt water. I have only to bring the calves to it once, when they will drink of their own accord. This I let them do till the quarter evil appears to be gone. I have not lost a single calf from quarter evil in three years, and yet the place is much subject to the disease. Five years ago I saved three calves out of six, and the first year after I applied the remedy I saved one out of five.—Yours, etc.,

J. H. VORSTER (F.'s SON).

Glencoe, Barkly East.

A REMARKABLE HATCH.

To the EDITOR, *Agricultural Journal.*

Sir,—A wonderful thing happened a few days ago. About a dozen eggs were put in a cake tray for use, where I think they were left about eighteen days. They were then placed in a food basket. where they were left about two days. On the morning of the third day it was found that one of the eggs had hatched, and the chicken is still alive but very weak.

Can any of your readers give his opinion regarding the cause of such a case and tell if any such cases have occurred elsewhere?—Yours, etc.,

J. A. JACOBS, JUN.

Uitvlugt, Prieska.

BEE PLANTS.

To the EDITOR, *Agricultural Journal.*

Sir,—To the already long list of bee plants published by the Transvaal Government Botanist in the first issue of the new *Agricultural Journal,* I beg to suggest the addition of the following:—

The wild or bitter chicory (*Chicorium incytivus*). which has been tried locally for the purpose. It blossoms nearly all the year round where irrigated, and is constantly visited by bees. Just before the seeds are getting ripe cut down with a sickle the more advanced stems (they are very irregular as to time of maturity) and new crops might be had for several years.

Culture identical to that of lucerne, to which it has much resemblance.

All the Curcubitacea family, principally the *Luffa acutangula,* a well acclimatized gourd plant used in Spain to make the yarn called *Cabellos des Angel* (Angel's Hair), very useful as a forage plant, a kitchen sponge, bathing rubber, coir filler, inside soles, etc.

The plant is sown at the first rains along wire fences or any other supporting material; plenty of flowers for four or five months, much appreciated by bees for comb-building.

The papaw tree (*Papaya carica*). It is only quite recently that I have noticed that all the overripe fruits had been eaten up by our most destructive finches, and that the bees were following the birds, taking voraciously to the soft pulp. If sliced up and put in the proximity of the apiary a very good feed and honey saver is thus utilized.

A practical apiarist might have with great benefit as much as he can use of clover, lucerne, and sainfoin for his stock, hedged by the Damascus rose, that with the great choice at his disposal must provide amply for his bees.

We have plenty of wild flowers in the summer here, but we too have noticed the notoriety of all the Euphorbiaceas, both trees and climbers, as to be distinctly nocive, sometimes very serious troubles having occurred after having taken honey from the hills which were clad with these plants; they must be all burned in the vicinity of the homesteads.—Yours, etc.,

H. M.

Spelonken, February, 1911.

BECHUANALAND WEATHER.

To the EDITOR, *Agricultural Journal.*

Sir,—It may interest your readers to hear something about Bechuanaland. We have had the driest year ever experienced here, and yet have lost but little of our stock. This part of the country is considered one of the poorest, but in my opinion experience will prove this to be an excellent country, if it be only camped off in order to allow stock to graze it off close to the ground, so that it does not require to be burned by fire. I have now been living here for nine months, and, according to my experience, farms will prove to be as healthy as any part of the Cape if they are only camped off properly. There is but little poison here, and vermin are out of the question.

I have not yet seen stock in poor condition, I mean when they are well cared for. I do not think that an animal will die of starvation here, as often happens in the Cape Province. I have now been running stock here for the last seventeen months, and I have lost but a few, only lambs, which came on in the winter. But this can be prevented; the lambs must come on after winter. Water is plentiful in this country. It is, therefore, not difficult to provide for the winter months. Again, the country is practically uninhabited, and it is now the time for farmers to procure farms. The country is rich in minerals, and diamonds have already been found. The prospects for a good market are therefore good. There is every likelihood that the train will run in our neighbourhood; only then shall we learn the possibilities of Bechuanaland.—Yours, etc.,

A. J. DU PLESSIS.

Vlakfontein, Taungs Station.

CASTRATION.

To the EDITOR, *Agricultural Journal*.

Sir,—In reply to the question of Mr Joubert, Swellendam, about the castrated horse, I would advise him not to do anything to the horse if he will only make sure that both of the testicles have been burned out.

I also castrate horses with the branding iron, and have such a horse in my service at this moment, which was castrated a few months ago, and has also got a swelling just like a testicle, but is able to do its work without any difficulty. I have seen more cases like this after castration. Do not worry. I think the reason is because the scrotum has not been cut off, but has only been opened in the burning process, in which case the large skin does not contract completely in every case. On account of its largeness, fat and membrane are formed, and this causes the swelling. Mr. Joubert need not be afraid that there is any danger. However, should the horse still trouble the mares, it must again be castrated, as the original castrator could only have burned out one testicle, in which case the soft swelling is a water testicle. I have seen several similar cases.—Yours, etc.,

D. A. BOTHA (P. P.'s son).

Rawsonville.

PROLIFIC FARM STOCK.

To the EDITOR, *Agricultural Journal*.

Sir,—Regarding a fertile boer she-goat, of which Mr. E. W. Fincham writes in the November *Cape Journal*, I can inform him that I have a boer she-goat which gave birth to fifteen kids in four years:—First year, four kids, three dead, one alive; second year, three kids all alive; third year, four kids still-born (injured); and last year four kids all alive.

But of course she could not raise more than two; the others I always took away. I had another she-goat last year which gave birth to four kids, all of which are still alive, and two of which I am rearing with cow's milk. I want to exhibit them at the Malmesbury show. I can attest to the truth of the above; the she-goats are both alive.—Yours, etc.,

H STEYN.

Malmesbury.

To the EDITOR, *Agricultural Journal.*

Sir,—In answer to the question in the December issue of the *Cape Journal* on prolificness in farm animals, I can quote a remarkable case, which will undoubtedly be interesting to readers of the *Agricultural Journal.* In 1896 we were suffering from a great drought when a boer goat ewe gave birth to five live kids. The mother remained quite healthy.—Yours, etc.,

J. A. JACOBS, JUN.

Uitvlugt, Prieska, 9th February.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

WEEDY THOROUGHBRED SIRES.

I should be obliged if you would kindly give me your opinion as to what is the best class of stallion to put to Colonial mares. I notice a good many instances that horses bred from thoroughbred race stallions turn out poor animals, and inclined to be weedy. My experience of this class of animal condemns it as a good riding horse, being too long in the back. Its action I also find fault with; in many cases the animal is only at ease at a fast canter which it cannot keep up. A trot or slow canter seems irksome for the animal. Do you not think that breeding from the hunter or hackney would give us a better stamp of animal than that above referred to?—F. JACKSON, Standerton.

Answer.—It all depends on the type of thoroughbred sire selected. Weedy sires will, as a rule, produce weedy, unreliable offspring unless very carefully mated on the dam side with carefully selected staunch strains. Like still produces like. But for all that the thoroughbred proves himself still to be the most satisfactory all-round sire. The modern hackney has a strong strain of thoroughbred blood, and the hunter is usually at least half-bred, if not more. So why draw from the polluted strain when the pure strain is obtainable? The fact is that people fancy the light thoroughbred because he has won races. The result is weedy stock. A carefully selected thoroughbred sire, if anything rather on the heavy side, well ribbed up, with good bone and plenty of muscles, is the ideal for a country like South Africa. Such a horse mated with selected mares should show very few failures.—EDITOR, *Agricultural Journal*.

DRYING PRUNES.

Could you kindly send me the best recipe for drying prunes?—W. H. ROSE-INNES, Murraysburg, Cape Province.

Answer.—Prune drying needs to be carried out on a large scale to be practical. It is first necessary to instal a dipping plant. This consists of a cauldron or boiler, into which is placed a lye solution—usually about 8 per cent. of caustic potash. This is heated and the prunes dipped in it in order to crack the skins and allow the moisture to evaporate in the subsequent drying. The prunes are placed in a wire dipper, like a net, immersed for a moment in the boiling lye, and then into a vessel containing cold water to wash the lye off. They are then dried in the sun on trays in the ordinary manner.—EDITOR, *Agricultural Journal*.

PIP IN POULTRY.

A little time ago I had a turkey ill and at the same time a fine fowl. I sent for a Dutch woman and asked her wh t to do. She at once took a hard skin from under the tongue of each, and told me that the birds had been suffering from pip and would now recover, which in a few days they did. Ever since, if I have seen a fowl not looking well and not eating, I have removed this horny skin from under the tongue, and almost invariably after three days the bird picks up and eats again. Now, the other day, just for an experiment, I caught a very healthy hen in the best of condition, opened her mouth, and took the pip off the tongue. Have all fowls this skin under the tongue, and is the removal of it in sickness beneficial when naturally the mouth is hot and dry, and in some way does this help? Or is this dry skin a sickness which gradually prevents their eating, as the Dutch woman told me? My own idea is that it is the same as in puppies in sickness; in the country, if you make the tongue bleed it seems to help, like cutting a duck's web.—Mrs. M. DAVIDSON, Nylstroom.

Answer.—Pip is a fairly common trouble with poultry. It can scarcely be called a disease, as it is generally the result of some stomach disorder; and if you give your fowls an occasional dose of Epsom salts you would not be troubled with it much. When it does occur, the scale should be removed as carefully as possible in order to avoid giving more pain than is necessary, and if a little glycerine is applied to the spot after the removal of the scale it will help to heal the sore place. It is only necessary to perform this operation when you see that the birds are suffering. The fact of the hard skin forming on the tongue prevents the bird from eating, as it makes the mouth very sore.—R. BOURLAY, Poultry Expert (Transvaal).

STEENBOK ZUURING.

I am writing to ask you if you can give me any advice with regard to steenbok zuuring. My land is becoming full of it, and I do not know how to get rid of it, as it seems to spread very fast under ground and also by seed. I have tried ploughing it up, but it does not seem to do much good. I have bought a plough that goes very deep, and I hope to get under the roots, and then pull the plants up by putting the spring-tooth harrow over the land, and then collecting the plants and burning them. I hope to be able to put the harrow over every month for at least ten to twelve months as I am letting the land lie over for a season to rid it of a little wild oats that is in it, and for the sake of trying the experiment. I would be very grateful if you could tell me any way that has already been tried or any other way of destroying the above-named weed, as it will undoubtedly spread over the whole land if I do not take steps to destroy it.—C. G. F., Tarkastad.

Answer.—"Steenbok zuuring" is the colloquial name of the weed mentioned; the botanical name is *Rumex acetocella.* This troublesome weed has often been discussed in the *Cape Agricultural Journal.* Some years ago Professor McOwan, who was then the

Government Botanist, explained at some length the ravages it was likely to cause in uncultivated lands. Although it was spreading very fast then, it seems to be spreading very much faster now, so that we do not seem to have brought it very much under control. One of the major contributory causes in the spread of steenbok zuuring is a lack of lime in the soil; therefore one of the most potent remedies to check its advance is to carefully lime your soils. The lime should be spread over the land fairly liberally and turned in neither too shallow nor too deep, but sufficiently deep for the roots of the steenbok zuuring to be able to absorb it in searching for plant food. The action of the lime on the plant is to wither it up, and it can then be eradicated very much easier than by any other means. Where soils are very poor and sour steenbok zuuring will be very difficult to get rid of.—EDITOR, *Agricultural Journal*.

WALNUT GROWING, BEES, BEE-PIRATES.

Kindly tell me (1) what I must do to make walnut branches, which I plant for growing trees, get roots; (2) what I must do in order to make honey bees build their combs along the top bar of the frames; (3) what I must do as regards a certain hard bee, a source of great trouble, which remains about the hive, catches the bees upon entering, and kills them.—P. MARTINS, New Bethesda.

Mr. Fred. Oosthuizen, sen., of Freyensfontein, Aberdeen, has a similar inquiry to Mr. Martins' third question. He says:—"I am much troubled by bee-catchers in my apiary. I have many hives close to my house, but never get a drop of honey, for the following reason. There are so many small bee-catchers about here that they very soon destroy a big swarm of bees by catching them before entering the hives. They place themselves before the hives ready to catch the bees, so that the bees are afraid to fly out and gather honey. It is a small and slender bee, colour yellow, dark stripes across the back, and size a little smaller than that of the honey bee."

Answer.—(1) *Walnut Growing*.—Mr. Martins' first query was referred to Mr. R. A. Davis, the Government Horticulturist (Transvaal), who, in reply, states that the layering of walnuts (which is evidently what Mr. Martins refers to) is not to be recommended. If it is desired to propagate walnuts, either seeds should be planted or else young trees should be purchased from a nurseryman.

(2) *Comb Building*.—Mr. Martins probably refers to combs in hives with movable frames. The foundation wax should be melted all along the top bars of the frames, as a guide for the bees to work by. If you have no foundation wax, place the hive so as to slant forward. The bees will start working at the highest end, and as soon as they have made a few combs the frames may be turned round alternately, when the bees will build the rest of the combs parallel to each other. In this way, however, the combs will not be made straight. It is better to use foundation wax.

(3) *Bee-Pirates*.—Full information on bee-pirates is given by Mr. C. W. Mally, the Entomologist for the Eastern Province of the Cape, in an article in the *Cape Agricultural Journal*, Vol. XXIII, page 206. There are several different kinds of bee-pirates. With

regard to the destruction of that known as the "banded bee-pirate" (*Palarus latifrons*), Mr. Mally says:—"The following means of destroying the pirates have been suggested by correspondents at different times. Watch for the pirates and beat them down with bushes and crush them. Or treat the branches with 'bird-lime', so that the pirate is held fast if you succeed in striking it. The branches which have been treated with bird-lime may be placed near the hive, and when the pirates settle on them to rest they cannot escape. On first thought it would seem likely that this method would catch a great many bees as well; but it is claimed that the bees do not visit the branches, but go to the hive as usual. A white plate or basin containing a little water has been found to give good results, but a little oil should be added, so that the pirates will be destroyed as soon as they drop into it. Whether they are dazzled by the glistening white of the plate or come on account of thirst and mistake their own reflection in the water for a bee and dart down after it, or whether they are fond of resting on a white surface, is difficult to say. In the latter case it would be advantageous to place some dark soil for some distance around the plate so as to make it more conspicuous. . . . I am inclined to believe that the 'plate method' is the simplest and most effectual way of fighting the banded pirate, *P. latifrons*, because it requires the minimum of time and the materials are simple and available everywhere. After the plates have been placed in position they need only be examined in the morning to remove the dead specimens and replenish the oil and water, if necessary. Paraffin is better than olive oil because it spreads over the water more evenly, and does not become rancid."

In a communication to a later issue of the same *Journal* (Vol. XXXIV, page 129), a correspondent, discussing methods of combating the bee-pirate, wrote:—"The plate method as described in your *Journal* is a slow but certain process to help get rid of them, but I find salad oil in place of parafin oil on the water is safer and more certain death. Pure white plates should be put on a level with the hive entrance, and as close as possible. The best plan, however, is to remove all the hives to an old vacated house. The pirate does not enter the house, only hanging about the outside, and while the bees are on the wing there is little chance of being caught."

The particular form of bee-pirate referred to by Mr. Oosthuizen is evidently known as the Yellow Bee-pirate (*Philanthus diadema*). Concerning remedies for this form of the pest, Mr. Mally says:—"As yet no satisfactory way of dealing with the species has been found. The 'plate trap' which was used for *Palarus latifrons* is useless for this species on account of its different habits. The females can be easily captured with a net as they leave or return to the burrows, but this takes a great deal of time. There may be a number of breeding grounds scattered about in unexpected places, so that it would be difficult to do more than check them to a certain extent. Since they capture the bees on the flowers, it is hardly likely that there will be a serious drain on any one hive. A proportionate number of bees will also come from wild colonies, but where a large number of bees are kept the aggregate loss may be more important, because a larger proportion of the victims will doubtless come from the hives."—EDITOR, *Agricultural Journal*.

Maize Export—January, 1911.

Bags of Maize Exported Oversea from the undermentioned Union Provinces and British South Africa Customs Union States during the one month ended 31st January, 1911 :—

TRANSVAAL.

Graded at.	White Flat.	White Round.	Yellow Flat.	Yellow Round.	Mixed.	Total.
Port Natal	5,719	—	—	199	—	5,918
Capetown	42,245	507	700	500	331	44,283
Port Elizabeth ...	19,426	—	—		—	19,426
East London ...			—			
TOTALS ...	67,390	507	700	699	331	69,627

ORANGE FREE STATE.

Graded at.	White Flat.	White Round.	Yellow Flat.	Yellow Round.	Mixed.	Total.
Port Natal	13,681	1	344	6,301	92	20,419
Capetown	—	50	61	1,033		1,144
Port Elizabeth ...	2,526	—	—			2,526
East London ...	—	—	—	—		
TOTALS ...	16,207	51	405	7,334	92	24,089

NATAL.

Graded at.	White Flat.	White Round.	Yellow Flat.	Yellow Round.	Mixed.	Total.
Port Natal	1,360	—	98	49	—	1,507

CAPE PROVINCE.

Graded at.	White Flat.	White Round.	Yellow Flat.	Yellow Round.	Mixed.	Total.
East London ...	—	—	—	—	—	—

BECHUANALAND.

Graded at.	White Flat.	White Round.	Yellow Flat.	Yellow Round.	Mixed.	Total.
Port Elizabeth ...		—	—	—	—	—

BASUTOLAND.

Graded at.	White Flat.	White Round.	Yellow Flat.	Yellow Round.	Mixed.	Total.
Port Elizabeth ...		—	—			
East London ...	—		—	—	—	
TOTALS ...	—	—		—	—	—

GRAND TOTAL 95,223

Notes on the Weather (Cape Province), December, 1910.

By CHARLES M. STEWART, B.Sc., Secretary, Meteorological Commission of the Cape.

A NORMAL mean pressure; monthly temperature very slightly lower than usual, but warmer than the average in the north and west and colder than usual over the south and east; an entire absence of frosts; an exceptionally small percentage of cloud; infrequent fogs; a rainfall only three-quarters of the usual depth; comparatively few thunderstorms; some destructive hailstorms; persistent but light southerly winds over the greater part of the country and few gales; these were the most noteworthy features of the weather of December, 1910.

Precipitation during December amounted, on the mean of 243 stations, to only 1·77 inches on five days, being 0·59 in. or 25 per cent. less than usual.

Division.	Mean Rainfall (1910).	Mean No. of Days.	Average Rainfall (1891-1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	0·53	3	1·24	4	— 0·71	— 57
South-west	0·37	2	0·79	3	— 0·42	— 53
West Coast	0·02	1	0·27	1	— 0·25	90
South Coast	2·27	7	1·93	7	+ 0·34	+ 20
Southern Karoo ...	1·02	2	0·51	2	+ 0·51	+ 100
West Central Karoo	0·24	1	0·87	3	— 0·63	72
East Central Karoo	0·77	2	1·90	5	— 1·13	— 59
Northern Karoo ...	0·40	2	1·65	4	— 1·25	76
Northern Border ...	0·19	1	2·04	5	— 1·85	— 91
South-east	3·72	8	3·48	9	+ 0·24	+ 7
North-east	2·04	6	3·75	8	— 1·71	— 46
Kaffraria	3·94	11	4·36	11	— 0·42	— 10
Basutoland	3·49	8	5·20	12	— 1·71	— 33
Durban (Natal) ...	—	—	5·12	—	—	—
Bechuanaland ...	2·14	6	3·93	8	— 1·79	— 46
Rhodesia	3·46	12	5·88	12	— 2·42	— 41

Rainfall in excess of the normal was confined to three sections—South Coast, Southern Karoo, and the South-east—varying in amount from plus 7 per cent. over the last to double the usual quantity over the Southern Karoo. Elsewhere there were deficits mostly exceeding 50 per cent., but varying between minus 10 per cent. over Kaffraria and 91 per cent. over the Northern Border. The mean for this month was 1·72 inches less than in December, 1909, or little more than half, but 0·32 inches more than during the previous month. The divisional means for this month are far below those for the corresponding month of last year; while compared with those for the preceding month there is a marked increase in the amounts registered over the South Coast, Southern Karoo, South-east, North-east, Kaffraria, Basutoland, Bechuanaland, and Rhodesia, but a decrease elsewhere. The usual "Christmas rains" failed to put in an appearance this year, their place being taken by the showers on the 30th. Summarizing the monthly totals it is found that of the 243 stations, 22 situated in the West Coast, the Karoo, and the Northern Border had *nil*; 65 had 0·01–0·50 inch; 29 had 0·51–1 inch; 44 had 1·01–2 inches; 27 had 2·01–3 inches; 28 had 3·01–4 inches; 11 had 4·01–5 inches; 6 had 5·01–6 inches; 7 had 6·01–7 inches; and 4 had over 8 inches—Wolf Ridge, 8·57 inches; Qacha's Nek, 8·99 inches; Port St. John's, 10·41 inches; Evelyn Valley, 10·84 inches. On similarly treating the maximum amounts recorded in twenty-four hours, it appears that of 242 stations furnishing the necessary particulars 106 had 0·00–0·50 inch; 52 had 0·51–1 inch; 54 had 1·01–2 inches; 20 had 2·01–3 inches; 6 had 3·01–4 inches; and 4 exceeded 4 inches—Keiskama Hock, 4·17 inches; Doutsah, 4·28 inches; Wolf Ridge, 5·30 inches; Evelyn Valley, 6·15 inches—all on the 21st, on which date occurred a series of thunderstorms affecting a very large area and causing the heaviest fall of the month at many other stations. *Thunderstorms* were mostly local or occurred over very

limited areas, except on the 21st, 29th, and 30th, when they were fairly general and widespread; in all, 259 instances of this phenomenon were reported on 27 days, or only about half the number noted during December, 1909, and only three-fourths those occurring during the preceding month. *Hail* was noted at thirty stations on eleven days, principally the 21st and 29th, being less frequent than during November last, but in excess of the number reported during the corresponding month of 1909. A destructive hailstorm, causing considerable damage, appears to have occurred on the 21st in the neighbourhood of Aberdeen, while several farms in the neighbourhood of Kokstad suffered from similar severe storms during the month. No snow or sleet reported.

Temperature, Cloud, and Winds.—The mean monthly temperature of all stations was 67°·7 or 4°·5 warmer than the previous month, and 2°·0 higher than the mean of the corresponding month of 1909. The mean maximum temperature (78°·9) was 4°·2 higher than in November, and 3°·0 higher than during the previous December; and the mean minimum was 4°·6 above that of the preceding month, and 0°·8 above the corresponding mean for the closing month of the previous year. The increase in the mean monthly temperature over that for November was therefore about equally divided between the days and the nights. The mean daily range was 22°·5. Compared with the average conditions, the mean day temperature was the same as usual, but the mean night temperature was 0°·3 less than the normal, thus reducing the mean monthly temperature 0°·2 lower than the average. In general terms, the mean monthly temperature may be said to have been above the normal north and west of a line joining Cape Agulhas and Aliwal North, and below the normal to the south and east of this line; the differences in both cases increase towards the coast, amounting to a few tenths at the more inland stations, increasing to 1-2° at stations on and near the coast. The greatest departures, however, were + 3°·4 above the average at Groot Drakenstein and — 3°·2 at Lovedale below the average, while the differences along the South Coast were limited to a few tenths above or below the normals. The mean day temperatures were above the average in the West and South-west mostly by 1-2°, and below the average a similar amount in the East and South-east; the differences along the South Coast being a few tenths in either direction (plus or minus). The mean night temperatures were mostly above the average by 1-2° in the West, over the Cape Peninsula, and the South-west, above or below the normal by a few tenths along the South Coast, and below the average elsewhere mostly by 1-2°, the departures ranging from + 2°·6 at Groot Drakenstein to — 4°·7 at Hanover. The mean warmest station was Kimberley with a temperature of 76°·3, and the mean coolest Port Nolloth, with 59°·2, a difference of 17°·1. The highest mean maximum, 92°·9) belongs to Kimberley and the lowest mean minimum (48°·8) to Hanover. The highest temperature readings were mostly registered during the last half of the month over the major portion of the country, particularly on the 27th and 19th, although the 1st and 2nd would appear to have been the warmest days over the Cape Peninsula, South-west, and portions of the South and South-east. The lowest readings do not appear to have been confined to any particular period, but occurred on eighteen days, fairly evenly distributed throughout the month, the only period of any duration in which such readings were not recorded being that from 15th to 21st inclusive. The dates on which these lowest temperatures occurred at the greatest number of stations were 23rd, 31st, 5th, and 13th. The mean value of the extreme maxima was 89°·4, or 0°·6 less than the previous month and 0°·3 lower than in December, 1909. The mean of the lowest readings at each station during the month was 49°·3 or 7°·5 above that for November last, and 2°·8 higher than in the corresponding month of the previous year. The mean monthly range (40°·1) was therefore 8°·1 less than in November and 3°·1 less than in December of 1910. Temperatures exceeding 100° F. occurred at seven stations, the highest being 103° at Cumnor (Vryburg Division) on the 19th, and temperatures below 40° F. were confined to Aliwal North, where 39° was registered on the 13th. The extreme monthly range was therefore 64° over all stations. No frost was reported during the month. At Retreat, in the Cape Peninsula, the mean minimum temperature over grass was 53°, or 4°·9 lower than the mean shade minimum, ranging from 39°·7 on 2nd to 67° on 9th.

The mean percentage of *cloud* was exceptionally low, being only 39 per cent., or 2 per cent. less than the preceding month, and 14 per cent. less than in December, 1909. The mean cloudiness over the various sections increased from ·30 per cent. over the Cape Peninsula to 47 per cent. along the South Coast and over the South-east, and increased still further to 53 per cent. over Kaffraria; over the South-west it averaged 16 per cent., but was from 25 to 35 per cent. over the central portions of the country, increasing to 58 per cent. at Kimberley and Hope Fountain (Rhodesia), but decreasing to 14 per cent. over Bechuanaland. The clearest skies were experienced at O'okiep where the mean cloudiness was only 4 per cent., while the skies were most obscured at Port St. John's where a mean of 74 per cent. of cloud was experienced during the month, Port Nolloth being next with 63 per cent. Fogs and mists were less than two-thirds of the number reported in December of the previous year and were practically the same in number as during the preceding month, eighty-four occurrences of this nature being noted on thirty days, most widely on the 28th, 15th, 16th, and 9th. The prevailing *winds* were mainly southerly (SE. to SW.) in the West and South-west, westerly along the South and South-east coasts, SE. to SW. in

the east, N. to NE. over the Northern Border and Bechuanaland. At Durban the NE. and SW. winds were practically of equal frequency, and similarly with east and west winds at Port St. John's. These winds were of no great strength, the mean force being 2·02, equivalent to a mean velocity of 8·1 miles per hour, or slightly less than during the previous month and the corresponding month of the previous year. The winds were strongest over the Cape Peninsula and the South-west, and weakest over the inland portions of the South-east and Kaffraria. The Royal Observatory records show a marked increase, in the morning winds, of those between S. and SE. and a practical absence of all other winds until the 30th and 31st, when light NW. and W. breezes were experienced; the mean force there was equivalent to a velocity of 9·1 miles per hour, or 1·1 mile per hour more than usual. Strong winds and gales were comparatively infrequent, being noted at only twenty stations on eleven days, chiefly the 21st, being only about half as numerous as in December, 1909, and about one-third the number reported during the preceding month. Hot winds were experienced at eight stations on seven days, and one duststorm on the 21st.

Mean barometric pressure at the Royal Observatory was practically normal (30·00 inches) ranging from 29·80 inches on the morning of the 20th to 30·12 inches at 8.30 a.m. of the 22nd.

TEMPERATURE.

Station.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory	78·6	60·4	69·5	95·7	1st	49·7	31st
Capetown (City Hospital) ..	79·3	59·8	69·6	99·0	1st	53·1	29th & 31st
Blaauwberg	72·5	57·1	64·8	88·0	19th	53·5	7th
Devil's Peak	72·6	53·5	63·0	90·0	1st	50·0	3rd, 4th, & 5th
Bishopscourt	74·1	55·3	64·7	89·5	1st	48·0	31st
Wynberg	76·9	58·3	67·6	89·5	1st	50·0	31st
Groot Constantia	75·1	58·4	66·8	89·0	1st	54·0	28th & 31st
Retreat	75·4	57·9	66·6	85·1	1st	47·3	2nd
Groot Drakenstein	86·5	59·8	73·2	100·8	1st	53·0	29th & 31st
Elsenburg Agricultural College	82·6	55·4	69·0	99·3	19th	49·0	4th
Port Nolloth	65·3	53·0	59·2	72·0	24th	48·5	1st
O'okiep	86·8	59·1	73·0	101·5	19th	48·0	9th
Port Elizabeth	74·1	60·4	67·2	94·0	2nd	55·0	5th
George (Plantation) ...	75·8	55·2	65·5	94·0	2nd	51·0	10th
Danger Point	68·4	57·7	63·0	75·0	27th	54·0	11th
Mossel Bay	73·7	59·9	66·8	88·0	2nd	56·0	5th & 23rd
Cape St. Francis	71·1	61·7	66·4	75·0	31st	56·0	5th & 11th
Cape Agulhas	72·4	60·0	66·2	75·0	27th & 29th	52·0	5th
Heidelberg	83·0	57·8	70·1	95·0	2nd	50·0	3rd
Amalienstein	85·8	57·4	71·6	95·0	2nd	51·0	23rd
Murraysburg	86·2	54·5	70·4	98·0	27th	47·0	22nd
Hanover	85·6	48·8	67·2	91·0	28th	42·0	22nd & 25th
Kimberley	92·9	59·7	76·3	100·3	20th	50·2	23rd
Bedford	79·5	53·9	66·7	98·0	20th & 27th	46·0	7th
Lovedale	78·5	55·9	67·2	100·0	2nd	49·0	10th & 13th
Sydney's Hope	75·7	55·0	65·4	95·8	2nd	50·0	12th
Cathcart	76·3	49·6	63·0	91·8	27th	41·5	13th
Evelyn Valley	72·2	50·2	61·2	88·0	2nd & 19th	41·0	10th
Chiselhurst	81·5	59·2	70·3	91·0	27th	51·0	9th
Aliwal North	85·0	52·1	68·6	92·5	15th	39·0	13th
Kokstad	75·9	51·3	63·6	91·0	21st	41·9	13th
Main	77·6	54·2	65·9	100·0	27th	49·0	12th
Tabankulu	75·2	53·4	64·3	93·0	21st	47·4	23rd
Port St. John's	76·2	62·8	69·5	82·0	16th	59·0	10th
Umtata	77·9	56·9	67·4	100·0	27th	51·0	12th & 13th
Mochudi	90·2	59·2	74·7	97·0	18th	49·0	14th
Cumnor (Vryburg)	92·5	58·5	75·5	103·0	19th	50·0	23rd
Hope Fountain	83·1	58·0	70·6	91·0	22nd	50·5	14th
Teyateyaneng	83·5	50·3	66·9	92·0	18th	40·0	23rd
Means	78·9	56·4	67·7	89·4	—	49·3	—
Extremes	—	—	—	103·0	19th	39·0	13th

OBSERVERS' NOTES.

Vruchtbaar (Wellington).—A very dry month, but excellent for the apricot growers, who have harvested a heavy crop of first-class fruit. A good percentage was manufactured as dried apricots, and selling at best prices.

Uitenhage Park.—Rainfall less than the December average at this station. Vegetation suffering towards the end of the month.

Calitzdorp.—Strong varying winds each day for two or three hours before and after midday.

New Bethesda.—Wheat crop fair; fruit dropping off trees owing to drought; trees dying; lucerne poor; water weak; prospects not at all bright.

Ryedale (Aberdeen).—A most unsatisfactory year for rains, as only about a quarter of the total fall (13·38) fell during the last seven months. Drought now serious here. We did not get any of that terrible hailstorm that fell on the 21st and did immense harm.

Sunnyside (Hay).—The rainfall for the year 1910 shows a decrease of over 36 per cent. when compared with the amount registered in 1909, the depths for the respective years being: 1909, 18·3 inches; and 1910, 11·54 inches. The month of December, 1910, also shows a decrease in proportion to the corresponding month of the past two years. This portends a rather dark outlook for the farming community of these parts, and it is to be hoped that a change will soon be forthcoming. The rain of the 28th and 29th was just in time to save the crops and veld from being entirely destroyed by the hot sun. Stock, especially horses and cattle, in rather poor condition, but otherwise free from disease.

Huxley Farm (Stutterheim).—The rains have done a bit of good to growing crops and veld. Live stock is doing very well. The total rainfall for the year is 25·16, a slight increase on last year's.

Kokstad.—Severe thunderstorms, doing damage to crops, are reported from the district.

Somerville (Tsolo).—The season promised well in October, but the scarcity of rain during November and December has reduced greatly the sowing of maize. Many gardens, among the natives, are unploughed. Grub has been destructive.

Groot Drakenstein.—This month, temperature was considerably in excess of the average, and rainfall was deficient. The south-easter blew almost without exception, the number of days totalling twenty-three, and everything was scorched up in consequence, though the force was never great. Mean temperature 3°·4 above the average ten years; mean maximum 4°·2 above the average ten years. Rainfall a little less than half the average (0·96 inch). The mean temperature for the year 1910 (63°·8) was 1°·2 above the average of ten years 1899–08 (62·6). This is the highest annual mean since records have been kept here, the previous record being 63°·7 in 1900. The rainfall (34·90 inches) was about normal, being only 0·67 inch below the average (35·57 inches).

Kokstad (Coyte).—Several farms have suffered from hail this month, but in town no damage has occurred. The year 1910 has proved exceptionally wet, 36·19 inches having fallen on 114 days. The fall is some 6 inches above the average.

Carnarvon Farm.—This has been a most disastrous month. Only 0·10 inches of rain up to 29th, on which and two succeeding days 1·03 inches fell, but too late to save wheat and oat crops. Potatoes and mealies suffered terribly. The 0·44 inch in November was all in driblets and did no good. So the two months of drought midsummer did for most crops. Stock did not suffer severely, and are now in good condition. Very little sickness about.

Rainfall, December, 1910.

I. CAPE PENINSULA:	Inches.
Royal Observatory (a) 12-inch gauge	0·07
Capetown, Fire Station	—
Do. South African College	—
Do. Molteno Reservoir	0.23
Do. Platteklip	0·32
Do. Signal Hill	—
Do. Hospital	0·04
Sea Point (The Hall)	—
Do. (Attridge)	—
Camp's Bay	0·04
Table Mountain, Disa Head	0·60
Do. Kasteel Poort	1·02
Do. Waai Kopje	1·13
Do. St. Michael's	1·25
Devil's Peak Blockhouse	0·69
Do. Nursery	0·84
Do. Lower Gauge	—
Woodstock (The Hall)	—
Do. (Municipal Quarry)	—
Do. (Do. Nipher's Shield)	—
Newlands (Montebello)	0·10
Claremont (Carrigeen)	—
Bishopscourt	0·93
Kenilworth	0·84
Wynberg (St. Mary's)	0·29
Groot Constantia	0·08
Tokai Plantation	—
Plumstead (Culmwood)	—
Muizenberg (St. Res.)	—
Fish Hoek	—
Simonstown (Wood)	—
Do. (Gaol)	—
Cape Point	0·21
Blaauwberg Strand	—
Robben Island	0·01
Durbanville	—
Maitland Cemetery	—
Tamboers Kloof	0·16
Woodhead Tunnel	0·46
Lower Reservoir	0·21
MacLear's Beacon	1·15
Wuai Vlei	1·01
Woodhead Dam	1·06

II. SOUTH-WEST:	
Eerste River	0·20
Klapmuts	—
Stellenbosch (Gaol)	0·27
Somerset West	0·09
Paarl	1·64
Wellington (Gaol)	0·09
Do. (Huguenot Seminary)	—
Groot Drakenstein (Weltevreden)	0·45
Porterville Road	—
Tulbagh	0·21
Ceres Road	—
Kluitjes Kraal	—
Ceres	0·60

II. SOUTH-WEST (*continued*):	Inches.
The Oaks	—
Rawsonville	—
Caledon	—
Worcester (Gaol)	0·04
Do. (Meiring)	—
Do. (Station)	—
Hex River	—
De Doorns	—
Karnmelks River	0·56
Lady Grey (Division Robertson)	—
Robertson (Gaol)	1·38
Do. (Govt. Plantation)	0·93
De Hoop	—
Montagu	2·03
Danger Point	0·15
Vygebooms River	—
Elgin Plantation	—
Elsenberg Agricultural College	1·35
Berg River Hoek	—
Wemmer's Hoek	—
Roskeen	—
Vruchtbaar	0·22
Ceres (Heatlie)	0·40

III. WEST COAST:	
Port Nolloth	—
Do. (Lieut. Barber)	0·00
Anenous	—
Klipfontein	—
Kraaifontein	0·00
O'okiep	0·00
Springbokfontein	—
Concordia	0·02
Concordia (Kraphol)	—
Garies	—
Lilyfontein	—
Van Rhyn's Dorp	0·00
Clanwilliam (Gaol)	—
Do. (Downes)	—
Dassen Island	0.00
Kersefontein	—
The Towers	—
Abbotsdale	—
Malmesbury	0·05
Piquetberg	0·00
Zoutpan	—
Wupperthal	0·00
Welbedacht	—
Algeria (Clanwilliam)	0·07
Cedarberg (Clanwilliam)	0·04

IV. SOUTH COAST:	
Cape Agulhas	0·08
Bredasdorp	0·50
Swellendam	2·60
Potberg	—
Zuurbrak	—
Grootvaders Bosch	3·09

IV. SOUTH COAST (*continued*):	Inches.
Heidelberg	1·35
Riversdale	1·15
Melkhoutfontein	—
Vogel Vlei	0·55
Geelbek's Vlei	—
Mossel Bay	0·86
Great Brak River	—
George	4·01
George (Plantation)	3·99
Woodifield (George)	—
Ezeljagt	—
Millwood	4·14
Sour Flats	2·08
Concordia	—
Knysna	—
Buffel's Nek	5·25
Plettenberg Bay	—
Harkerville	3·12
Forest Hall	—
Blaauwkrantz	6·70
Lottering	3·40
Storm's River	—
Witte Els Bosch	2·23
Humansdorp	—
Cape St. Francis	1·53
Hankey	—
Witteklip (Sunnyside)	—
Van Staaden's (Intake)	—
Do. (on Hill)	—
Kruis River	—
Uitenhage (Gaol)	1·52
Do. (Park)	1·31
Do. (Inggs)	—
Armadale (Blue Cliff)	0·70
Dunbrody	—
Port Elizabeth (Harbour)	0·50
Do. (Victoria Park)	—
Do. (Walmer Heights)	1·71
Shark's River (Nursery)	1·31
Do. (Convict Station)	—
Tankatara	—
Centlivres	1·79
Edinburgh (Knysna)	3·26

V. SOUTHERN KARROO:	
Verkeerde Vlei	—
Bok River	—
Triangle	—
Touws River	—
Do. (D.E. Office)	—
Pietermeintjes	—
Grootfontein	—
Ladismith	2·80
Amalienstein	1·16
Seven Weeks' Poort	—
Calitzdorp	0·36
Oudtshoorn	0·73
Vlaakte Plaats	0·80
Uniondale	0·25
Kleinpoort	—
Glenconnor	—
Rust en Vrede	—

VI. WEST CENTRAL KARROO:	Inches.
Matjesfontein	—
Laingsburg	—
Prince Albert Road	—
Fraserburg Road	—
Prince Albert	0·00
Zwartberg Pass	—
Booi's Kraal (Beaufort West)	—
Beaufort West (Gaol)	0·09
Dunedin	0·00
Nel's Poort	0·22
Camfers Kraal	—
Lower Nel's Poort	—
Krom River	—
Baaken's Rug	0·46
Willowmore	0·51
Rietfontein	—
Steytlerville	0·35
Vondeling (Willowmore)	0·30

VII. EAST CENTRAL KARROO:	
Buffels Kloof	0·26
Aberdeen (Gaol)	—
Do. (Bedford)	—
Corndale	—
Aberdeen Road	—
Klipplaat	0·49
Winterhoek	—
Klipdrift	1·39
Kendrew (Holmes)	—
Do.	—
Graaff-Reinet (Gaol)	0·74
Do. (Eng. Yard)	—
Do. (College)	—
New Bethesda	0·53
Roodebloem	—
Glen Harry	—
Wellwood	—
Do. (Mountain)	—
Bloemhof	—
Jansenville	0·10
Patrysfontein	—
Bethesda Road	—
Afrikander's Kloof	—
Roode Hoogte	0·00
Toegedacht	—
Klipfontein	0·70
Cranemere	0·00
Pearston	—
Darlington	—
Walsingham	—
Arundale	—
Doornbosh (Zwagershoek)	—
Middlewater	0·00
Somerset East (Gaol)	2·08
Do. (College)	—
Longhope	—
Cookhouse	—
Middleton	1·73
Spitzkop (Graaff-Reinet)	1·92
Bruintjes Hoogte	—
Gordonville (Graaff-Reinet)	0·45
Muchputfontein	0·25
Zeekoe River	1·67

VIII. NORTHERN KARROO:	*Inches.*
Calvinia	—
Middlepost	—
Brandvlei	—
Onderste Doorns	—
Sutherland	—
Fraserburg	0·03
Scorpions Drift	—
Rheboksfontein	—
Klein Vlei	—
Carnarvon	0·00
Loxton	—
Beyersfontein	—
Wagenaars Kraal	—
Brakfontein	0·56
Victoria West	0·24
Omdraais Vlei	—
Doorskuilen	—
Britstown	0·36
Wildebeestkooij	0·45
Murraysburg	0·72
De Kruis (Murraysburg)	0·50
Richmond	0·00
De Aar	—
Middlemount	—
Hanover	0·30
Theefontein	—
Zwagersfontein	—
Philipstown	0·05
Boschfontein	—
Petrusville	0·00
The Willows (Middelburg)	0·00
Naauwpoort	—
Middelburg (Gaol)	—
Do.	—
Do. (Government Farm)	—
Jackalsfontein	—
Ezelpoort	—
Plaatberg	—
Grape Vale	—
Ezelfontein	—
Roodepoort	—
Groenkloof	—
Vlakfontein	—
Vogelsfontein	—
Plaatfontein	—
Colesberg	0·10
Tafelberg Hall	—
Rietbult (Colesberg Bridge)	—
Fish River	—
Varkens Kop	—
Culmstock	—
Droogefontein	—
Stonehill	—
Cradock (Gaol)	0·48
Witmoss	—
Varsch Vlei	—
Maraisburg	0·20
Steynsburg (Gaol)	0·98
Riet Vlei	—
Hillmoor	—
Quagga's Kerk	—
Tarkastad	0·99
Do. (Dis. Engineer)	—
Drummond Park	—
Glen Roy	—
Waverley	1·88

VIII. NORTHERN KARROO (*continued*):	*Inches.*
Gannapan	—
Montagu	—
Grape Vale	—
Rietfontein (Cradock)	—
Schuilhoek	—
Vosburg	0·13
Zwavelfontein	—
Holle River (Colesberg)	—
The Meadows (Schoombie)	—
Ruightersfontein	0·48

IX. NORTHERN BORDER:	
Pella	—
The Halt	—
Keimoes	—
Kenhardt	0·00
Upington	0·14
Trooilapspan	0·00
Van Wyk's Vlei	0·00
Prieska	0·00
New Year's Kraal	0·32
Dunmurry	0·05
Karree Kloof	0·60
Griquatown	0·00
Campbell	—
Douglas	—
Avoca (Herbert)	—
Hopetown	—
Orange River	0·20
Newlands (Barkly West)	0·23
Barkly West	0·05
Bellsbank	—
Kimberley (Gaol)	—
Do. Stepheus	0·55
Strydenburg	0·33
Douglas (Voss)	0·15
Stoffkraal (Prieska)	0·54
Rocklands	0·32
Peters Park (Gordonia)	0·05

X. SOUTH-EAST:	
Melrose (Div. Bedford)	1·05
Dagga Boer	1·35
Fairholt	—
Lynedoch	—
Alicedale	1·25
Cheviot Fells	—
Bedford (Gaol)	2·35
Do. (Hall)	2·00
Sydney's Hope	2·12
Cullendale	—
Adelaide	1·54
Atherstone	3·57
Alexandria	2·61
Salem	—
Fort Fordyce	—
Fountain Head	—
Grahamstown (Gaol)	3·91
Do.	—
Heatherton Towers	—
Sunnyside	2·84
Vischgat	—
Fort Beaufort	2·58
Katberg	4·75

X. SOUTH-EAST (*continued*):	*Inches.*
Balfour	—
Seymour	3·13
Glencairn	2·86
Alice	3·01
Lovedale	3·39
Port Alfred	3·68
Hogsback	—
Peddie	2·78
Exwell Park	1·79
Keiskamma Hoek	5·18
Cathcart (Gaol)	4·36
Cathcart (Forman)	5·90
Cathcart	—
Thaba N'doda	3·74
Evelyn Valley	10·84
Crawley	1·83
Thomas River	—
Perie Forest	—
Forestbourne	5·79
Isidenge	6·18
Kologha	5·35
Kingwilliamstown (Gaol)	2.94
Do. (Dr. Egan)	—
Stutterheim (Wylde)	—
Do. (Bestó)	—
Fort Cunynghame	2·12
Dohne	—
Kubusie	5·10
Quacu	2·63
Blaney	1·50
Kei Road	—
Berlin	—
Bolo	—
Fort Jackson	—
Prospect Farm (Komgha)	—
Komgha (Gaol)	4·01
Chiselhurst	3·12
East London West	—
Do. East	—
Cata	6·08
Wolf Ridge	8·57
Dontsah	6·50
Mount Coke	4·58
Blackwoods	—
Albert Vale (near Bedford)	1·51
Huxley Farm (Stutterheim)	2·79
Insileni (K.W.T.)	6·62

XI. NORTH-EAST:	
Venterstad	0·75
Mooifontein	—
Burnley (Cyphergat)	—
Burghersdorp (Gaol)	1·81
Ellesmere	—
Molteno	—
Lyndene	—
Cyphergat	—
Thibet Park	1·19
Sterkstroom (Station)	0·80
Do. (Gaol)	—
Rocklands	—
Aliwal North (Gaol)	3·69
Do. (Brown)	—
Do. (Dis. Engineer)	—
Buffelsfontein	—

XI. NORTH-EAST (*continued*):	*Inches.*
Hex's Plantation	—
Poplar Grove	—
Carnarvon Farm	1·13
Halseton	—
Jamestown	—
Whittlesea	3·17
Queenstown (Gaol)	1·40
Do. (Beswick)	—
Rietfontein (Aliwal North)	—
Middlecourt	—
Dordrecht	3·44
Tylden	—
Nooitgedacht	—
Herschel	2·86
Lady Grey	3·56
Lauriston	3·01
Lady Frere	3·48
Contest (near Bolotwa)	—
Sterkspruit	—
Doornkop	—
Avoca (Barkly East)	—
Keilands	0·69
Palmietfontein	—
Barkly East	1·10
Blikana	1·06
Glenlyon	—
Rhodes	—
Gateshead	—
Cliftonvale	2·94
Albert Junction	—
Queenstown (District Engineer's Office)	—
Hughenden	—
Glenwallace	—
Indwe (District Engineer's Office)	—
Bensonvale Inst. (Herschel)	—
Cathcart (Queenstown)	—
Royal (Div. Albert)	—
Edendale	2·05
Strydpoort	1·44

XII. KAFFRARIA:	
Ida (Xalanga)	—
Slaate (Xalanga)	3·64
Cofimvaba	2·62
Tsomo	1·72
N'qamakwe	—
Main	1·63
Engcobo	4·10
Butterworth	3·28
Woodcliff	—
Kentani	4·30
Maclear	3·70
Maclear (Station)	3·45
Bazeya	—
Willowvale	3·74
Mount Fletsher	—
Somerville (Tsolo)	2·38
Elliotdale	—
M'qanduli	—
Matatiele	—
Umtata	2·56
Cwebe	—
Tabankulu	3·22
Mount Ayliff	—

XII. KAFFRARIA (*continued*):	*Inches.*
Kokstad	2·96
Do. (The Willows)	2·98
Seteba	6·50
Flagstaff	4·29
Insikeni	—
Port St. Johns	10·41
Kilrush (Sneezewood)	—
Umzimkulu (Strachan)	3·80
Mandileni	—
Wanstead	—
Cedarville	—
Luisikisiki	6·54
Elton Grange	4·95
XIII. BASUTOLAND:	
Mafeking	—
Mohalies Hoek	1·39
Maseru	1·95
Teyateyaneng (Berea)	1·65
Moyeni Quthing	—
Qacha's Nek	8·99
Leribe	—
Butha Buthe	—
XIV. ORANGE RIVER COLONY:	
Bloemfontein	—

XV. NATAL:	*Inches.*
Durban (Observatory)	—
XVI. TRANSVAAL:	
Johannesburg	
XVII. BECHUANALAND:	
Taungs	0·67
Vryburg	0·61
Mafeking	3·02
Setlagoli	—
Kuruman	—
Zwartlaagte	—
Mochudi	4·58
Cumnor (Vryburg)	1·82
XVIII. RHODESIA:	
Hopefountain	2·93
Rhodes' Matopo Park	3·98
XIX. DAMARALAND:	
Walfish Bay	—

Agricultural Show Dates, 1911.

CAPE PROVINCE.

Wodehouse (Dordrecht).—7th and 8th March.
Middelburg.—7th and 8th March.
Humansdorp.—8th and 9th March.
Caledon.—9th March.
Bathurst.—9th and 10th March.
Somerset East.—10th March.
Kingwilliamstown.—10th and 11th March.
Cradock.—14th and 15th March.
Molteno.—15th and 16th March.
Grahamstown.—16th and 17th March.
Port Elizabeth.—21st to 24th March.
Oudtshoorn.—28th and 29th March.

TRANSVAAL PROVINCE.

Ermelo.—9th March.
Volksrust.—15th and 16th March.
Standerton.—22nd March.
Wolmaransstad.—5th April.
Heidelberg.—12th and 13th April.
Johannesburg.—19th to 22nd April.
Schweizer Reneke, Bloemhof, Christiana } Combined.—3rd May.
Potchefstroom.
Waterberg.—10th May.
Zoutpansberg.—17th May.
Rustenburg.—24th and 25th May.
Pretoria.—30th May to 1st June.
Barberton.—23rd June.

ORANGE FREE STATE PROVINCE.

Frankfort.—7th and 8th March.
Jagersfontein and Fauresmith.—7th and 8th March.
Senekal.—7th and 8th March.
Thaba 'Nchu.—8th and 9th March.
Harrismith.—8th and 9th March.
Edenburg.—15th and 16th March.
Bethlehem.—15th and 16th March.
Boshof.—15th and 16th March.
Winburg.—21st and 22nd March.
Heilbron.—22nd and 23rd March.
Ficksburg.—22nd March.
Bloemfontein.—28th, 29th, and 30th March.

NATAL PROVINCE.

Vryheid.—June (date not fixed).
Newcastle.—13th and 14th June.
Dundee.—15th and 16th June.
Ladysmith.—2[illegible]th and 2[illegible]st June.
Victoria County.—21st June.
Alfred County.—21st June.
Weenen (Estcourt).—22nd and 23rd June.
Richmond.—27th June.
Umzinto.—28th June.
Pietermaritzburg.—29th and 30th June and 1st July.
Camperdown.—3rd July.
Durban.—5th, 6th, and 7th July.
New Hanover.—2[illegible]th July.
Mid Illovo.—10th August.

Departmental Notices.

SUPPLY OF PEACH PITS.

Mr. H. Versfeld, Barrydale, Swellendam (Cape Province), is able to supply a quantity of these to early applicants at 1½d per lb., delivered at nearest station, with an extra charge of 6d. for the bag.

BRANDS AND FENCING DIVISION.

The undermentioned fencing material can now be supplied to bona fide farmers of the Transvaal Province for cash payment:—

Straining posts, standards (bulb T and Lochrin patent), droppers for five and six wires, barbed wire, plain No. 8 and No. 10 wire, tubular and wrought-iron gates (15 feet by 4 feet), wrought-iron gates (4 feet by 4 feet), and gate posts.

Prices can be obtained on application to the Controller of Fencing, Box 434, Pretoria. As the Transvaal Fencing Law has not yet been extended to the other Provinces of the Union material can only be supplied for use on Transvaal farms.

FRUIT TREES FOR SALE.

GOVERNMENT EXPERIMENTAL ORCHARD, POTCHEFSTROOM.

The following is a complete list of the fruit trees for sale for the coming planting season. As in former years the price is 1s. per tree, with the exception of apples, which, being worked on blight proof stocks, are worth 1s. 3d. Owing to the wider ground of distribution under Union, the number of trees allotted to one applicant is limited to 100.

Many varieties are propagated with special reference to their suitability to Transvaal conditions only.

Orders may be sent in to arrive on 1st May, and will be dealt with strictly in rotation; those from bona fide farmers receiving preference. They may be sent to the Government Horticulturist, Agricultural Department, Pretoria, and will be duly acknowledged and information given in due course as to whether they can be executed or not. Where the delivery of trees is promised, an account will be sent in June for the amount due, and the trees must be paid for before 1st July. Delivery will take place during July, carriage forward.

No guarantee is given that all orders can be executed.

The collect on delivery system adopted last year resulted in considerable loss to the Department, and that has led to the adoption of the above system.

Cheques and postal orders should be made payable to the Government Horticulturist, Agricultural Department, Pretoria.

Double Flowering Peaches:	
Clara Meyer	27
Rosa Fl. Plena	29
Double Crimson	20
Versicolor	35
Double Pink	16
Splendens	10
Peaches:	
Belle Bauce	17
Elberta	46
Mountain Rose	40
Abec	37
Crimson Galande	37
Dr. Hogg	42
Mamie Ross	36
Oriole	49
Peento	35
Waldo	41
Pallas	34
Brook	22
Apricots:	
Powell's late	10
Warwick	22
St. Ambrose	4
Blenheim	27
Early Newcastle	27
Early Cape	15
Bush Peach	12
Kaisha	27
McLea's late	15
Montgamet	43
Large Early	6
Royal	24
Japanese Plums:	
Shiro Smomo	47
Ura Beni	55
Chabot	45
Burbank	61
Satsuma	33
Red Nagate	57
Royal	22
Japanese Plums—(*continued*):	
Wickson	24
October Purple	31
Chalcot	27
Combination	5
Methley	4
Bartlett	5
Pears:	
Ile de Vienna	46
Beurre Superfin	50
Douglas	20
Fertility	23
Beurre Diel	28
Beurre Easter	28
Bon Chretien	45
White Doyenne	15
Louise Bonne de Jersey	52
Apples:	
Adam's Pearmain	38
Wemmershoek	42
Roxbury Russet	25
Alexander	2
Stirling Castle	19
Bismarck	3
Watsonville Special	3
England's Glory	16
Rhode Island Greening	19
Lady Henniker	8
Lady Carrington	24
Ohenimuri	14
Nickajack	13
Cleopatra	2
Rome Beauty	18
Versfeld	8
Stone Pippin	16
Taupaki	9
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Stiff-Sickness and *Crotalaria Burkeana*.

The following letter has been received from Mr. G. W. Turpin, of Woodridge, Dohne, Cape Province:—"As I have been troubled with stiff-sickness in my cattle, I was greatly interested in Dr. Theiler's report on the disease in the first issue of the *Journal*. In these parts we have always upheld Dr. Hutcheon's theory that the cause was want of phosphates in the soil, and I have found that, as long as I keep my cattle well supplied with crushed bones, the disease does not appear. The cattle on this farm and on farms where stiff-sickness appears are always ravenous after bones—sheep dying on the veld have barely time to rot before the cattle have eaten up every bone—and why is it that only on these farms where there is such a craving for bones do you find this disease? I have been unable to find the plant *Crotalaria Burkeana* on this farm, and if not here it cannot be the cause of the disease down here. I have at the present time four head of cattle with stiff-sickness, all young heifers with their first calf, and since I read the article in question a house calf, six months old, has contracted the disease. Now, this calf lives in a small paddock at the house where, I am perfectly certain, this plant does not grow. A peculiar thing about this disease, with me, is that the progeny of imported stock are more subject to it than the common cattle, and I have never had an ox take it. My idea is that the stiff-sickness in the Transvaal caused by *Crotalaria Burkeana* is a different disease to the one we get down here. If your Department will send me a specimen of the plant I will try to locate it, and if not here we will then have to look for some other cause, and perhaps Dr. Hutcheon's theory will be right after all".

Mr. Turpin's letter was submitted to Dr. Theiler, who replies as follows:—"With reference to the attached letter from Mr. Turpin, forwarded under cover of your minute of the 7th instant, I have to inform you that I am not in a position to state whether Mr. Turpin's interpretations are correct. It will first of all be necessary to make an inquiry, and if *Crotalaria Burkeana* is not on the farm, the subject will require further investigation. The want of phosphates as the cause of disease is known in many other parts of the world, but the lesions of stiff-sickness, known to be typical of South African stiff-sickness, have not been described yet in connection with the disease caused by want of phosphates". A specimen of *Crotalaria Burkeana* has been sent to Mr. Turpin in order to assist him in searching for the plant on his farm.

Stock-Judging at Shows.

Writing to a Rand contemporary on the subject of training judges for agricultural shows, Senator G. G. Munnik says:—" It has occurred to me that it would be a good thing if the Government would cause the students at the agricultural farms and the proposed college at Pretoria to be trained in the elementary principles of stock-judging. At present, judging at our agricultural shows is undertaken as a labour of love by men interested in stock-raising, who may be said to have a fair average knowledge of the subject; but in many cases the result of their labours leaves much to be desired, and with all this the secretaries of agricultural societies say that they have great difficulty in providing competent judges for their exhibitions.

" Stock-judging is a much more important matter than appears at first sight, in which incompetent judges, local and other influences often play a prominent part, while often the schedule of a show is decorated with influential names regardless of the competency of the bearers thereof. It need not be argued that the appraising eye is of the greatest service to the student of agriculture, nor that it is a positive necessity to the man who makes farming his life's business, and to understand why one animal is better than another is not always given to the untutored eye, and therein lies the difficulty in obtaining competent judges who will command the confidence of, and give satisfaction to, the exhibitors on the one hand and the public on the other.

" There can be no doubt that the elementary assistance obtained on the Government college-farms is sure to prove of the greatest benefit in educating future stock-judges to a scientific knowledge of the requisite points in a pure animal. The American system of score-cards could be introduced with advantage on the stock farms, and might be well employed in testing a student's capacity for placing animals. It is true that the character of an animal destined for stud purposes has just as much to do with its quality as points marked on a score-card, but the student's eye—with practice—would learn to mark the character of an animal in addition to his score-card perfections. In England, praiseworthy efforts have been commenced to train young judges by testing their capacity to place animals before the appointed experts at agricultural shows set to work. Such contests have been opened to the sons of farmers and stock-breeders who attend the exhibitions. This might also be done here. Anyway, a commencement in the training of young judges and the establishment of judging competitions would be a far-sighted step."

Western Province Egg-Laying Competition.

Particulars have been received of the Fourth Egg-Laying Competition which is being organized by the Western Province Agricultural Society to be started on the 16th May next. The competition will cover twelve months. Entries close on the 15th April, and the entry fee for members of the society has been fixed at 10s., for non-members £1, per pen. Arrangements will be made to keep over any birds from the present (third) competition should owners so

desire. The awards will be as follows: 1st prize, gold medal; 2nd prize, silver medal; 3rd prize, bronze medal. First class certificates will be awarded to pens laying over 2100 ounces in weight of eggs, and second class certificates to pens laying over 1800 ounces in weight of eggs during the twelve months. The competition, it is of interest to note, is open to the whole of South Africa.

The conditions of the competition are as follows:—(1) The pen laying the greatest weight of eggs shall be declared the winner. Soft-shelled and shell-less eggs will not count, and after 1st July, 1911, any eggs weighing less than 1½ ounces will be disqualified. (2) Each pen must consist of six hens of any recognized pure breed hatched in South Africa. The date of hatching must be given in each case. All the six hens must be of the same breed. The number of pens is limited to forty. Competitors are not allowed to enter more than one pen of the same variety. (3) The society retains the right to return any birds which may be suffering from any disease, and any birds which may at any time become, in the opinion of the committee, unfit to be retained in the competition; also to return any pens which have not laid 100 eggs by the 30th September, 1911. (4) In the event of any bird dying during the course of the competition, or being returned by the committee as unfit, the owner shall have the option of replacing same, foregoing any score which may have been made by the dead or unfit bird. (5) In the event of applications exceeding the number of pens available, applicants who have entered more than one pen of different breeds will be limited to one pen, and shall be given the choice as to which breed they desire to have represented. In the event of entries being still too numerous, the right to compete shall be decided by ballot. (6) No competitor shall communicate with the attendant except through the secretary, and any competitor offending against this rule shall be liable to disqualification. (7) The society, while taking all reasonable care and precautions, will not hold itself responsible for the loss or injury of any birds. The secretary of the Western Province Agricultural Society is Mr. A. A. Persse, and his address is P.O. Box 1134, Capetown. Any birds sent by rail should be consigned to Rosebank Station.

Supply of Carp and Trout.

Attention is drawn to the notice which appears elsewhere inviting applications for carp, trout fry, or "eyed ova" from the Jonker's Hoek Trout Hatchery, Stellenbosch. It will be observed that applications must reach the Curator of the Trout Hatchery not later than the 30th April of each year. Full details as to method of procedure will be found in the notice.

Sub-Soil Drainage at Pienaarspoort.

Some particulars relative to the system of sub-soil drainage in vogue on Mr. S. Marks' farm at Pienaarspoort, in the vicinity of Pretoria, as reported on by the Circle Engineer, Pretoria, may be of interest. About fourteen years ago Mr. Marks planted an extensive orchard on his farm, Pienaarspoort, and, with the exception of fifty

acres, it has proved successful. The unsuccessful area is swampy, and the trees planted on it have either died or become unproductive. In order to maintain the symmetry of the orchard and to utilize a piece of ground which might otherwise become a waste in the centre of a well-developed farm, it was decided to drain it. Mr. A. G. Turner, the manager of the farm, has designed and carried out the drainage on the lines of European practice. He has laid out a main drain in the most suitable position and connected with at, at intervals, subsidiary laterals. The dead ends of the laterals are about 2½ feet, and the main drain about 4½ feet below the surface. The fall in the main drains is the natural fall of the ground at right angles to the contours; that in the laterals is obtained by directing them at a sufficient angle to the main drain to obtain an adequate fall. The main drain contains two 3½-inch earthenware pipes, and the laterals one or two pipes according to the volume of water disclosed by the excavation; above the pipes layers of broken stone are placed in order to ensure percolation and to prevent as far as possible the silting up of the pipes. The amount of water drained out of the land has been measured; in the winter it is 40,000 gallons per day, and 90.000 gallons daily during the rainy season.

South Africa as a Meat Producer.

In the course of a discussion at a meeting of the Authors' Club, London, on 23rd January, on "The Educational Problem in South Africa", Mr. Loudon M. Douglas, F.R.S.E., of Edinburgh, had some interesting remarks to offer on the agricultural future of South Africa, particularly from the point of view of meat production. The South Africa they had originally known, Mr. Douglas said, had been a country celebrated for its mineral wealth; to-day it was on the eve of enormous agricultural developments. A cursory glance at the imports into the various Provinces that constituted the South African Union would show that the annual imports of articles of food and drink alone amounted to a value of about £6,000,000 sterling, and that sum was largely paid out for commodities which could be quite easily produced from the soil of South Africa; indeed, some would say that the fertility of the soil there surpassed that of any other country in the world.

Proceeding, the speaker said he would confine himself, therefore, to this single aspect of the question, and would not deal with the hundreds of other products which were contingent upon the successful development of agriculture, and he would suggest that this was purely a question of education. The climatic conditions of South Africa were perfect for most agricultural operations, and what was required was the application of modern methods. It must be confessed that there was room for the adoption of modern methods in many parts of South Africa, and that there was a disposition to treat scientific farming with indifference. That was one of the reasons why the food imports referred to were so high in value. It was really astonishing to find that the total quantity of meats imported exceeded 15,000,000 pounds in weight per annum, and that these consisted, to a large extent, of the common products of agriculture, such as beef,

mutton, and bacon. He suggested that such a state of affairs was due to the absence of education and organization, and that the main thing required at present was instruction and demonstration in the production and handling of the live stock required for food. With such vast territories as existed in the South African Union, there should be little trouble in exporting meat products in huge quantities to Europe. This was indeed a most likely field for South African enterprise, and one which was well within practical realization.

They had seen lately that in many European countries, such as Germany, Portugal, Switzerland, Italy, and Austria, a general agitation had been going on against the prohibitiveness of flesh food from other countries. The dearness of such food had given rise to riots and turbulent scenes, which had had the effect of removing the barriers of prohibitions in some countries. Doubtless the inevitable starvation of the poor in these countries, where flesh food is dear, would cause such agitation as would result in compelling the opening of the frontiers to food supplies from overseas. Then would be the opportunity of South Africa as a food-producing country for the millions of Europe. In the meantime it might be said that to be forewarned was to be forearmed—at least so far as prudent people were concerned—and he was quite sure that there were many who were acquainted with South African conditions who would advise that the policy of development in agriculture should be along the lines indicated.

A New Type of Cooling Plant.

Since the early days of mechanical refrigeration there have been many rapid changes in the development of cooling effects. At one time it was only possible to work mechanical refrigerators on a large scale at a profit, hence the use of cooling effects in the preservation of meat, fish, dairy produce, and other perishable foodstuffs was confined to the comparatively few. During the last twenty-five years, however, very rapid strides have been made in the construction of refrigerating machinery, and the tendency has been towards making small machines which would suit the smallest trader. The cost of even these smaller machines, however, is very considerable, but this difficulty appears to have been overcome by Messrs. William Douglas & Sons, Limited, the well-known refrigeration specialists, of Putney, London, who have devised a small cooling plant which will be well within the reach of small meat-purveyors, fishmongers, dairymen, farmers, country houses, poulterers, confectioners, and others. The plant, it is stated, will cost less than £100, and this will include the cold-room and other appurtenances. The space available will be equal to holding more than a ton of solid perishable food, so that an idea of the cubical capacity may be gleaned from this.

In this new plant, the compressor (which is, the manufacturers claim, the smallest, for its output, ever seen) can be run coupled direct to any form of electric motor, petrol engine, oil engine, or gas engine, thus dispensing entirely with costly intermediate or speed-reducing gears, and, as no solid foundation is necessary, a further

saving in the cost of fitting up is obviously effected. The machine is quadruple acting, but has only one gland, which is automatically relieved of pressure, and with such things as leathers, valves, springs, piston rods eliminated, there is nothing left to cause trouble or require skilled attention. The moving parts of the compressor run in a bath of arctic oil, and the low pressure at which it works is automatically maintained on both sides of the piston at the same time, which renders piston rings unnecessary.

The Feeding of Pigs.

At a meeting of the Farmers' Club—the oldest agricultural club in the United Kingdom—held in London on the 23rd January, Mr. Loudon M. Douglas, the well-known authority on matters connected with the meat industry, read an interesting paper on "Swine Husbandry", in the course of which he had some useful remarks to offer on the feeding of pigs that should be of interest to South African readers. "Kellner", Mr. Douglas said, "has approached the subject from the scientific point of view, and he states that in the feeding of young pigs no investigation has been able to throw any light on their requirements. We have, therefore, to fall back upon practice. When the young pigs are capable of taking a sufficient amount of food for themselves, they should be accustomed, as quickly as possible, to the use of such foods, and their protein constituents should be high. In this respect cereals, such as maize and barley, have different protein values, and it has been shown that maize alone does not give such a large daily increase of weight as does barley. The same relative proportions are maintained when the cereals are mixed with separated milk.

"Rations for young pigs, when they have been arrived at, should be given methodically, say, three times a day, and if profitable results are to be obtained, the sty in which they are fed should be clean, warm, and well ventilated, but should there be an excess of heat, troubles are sure to ensue. The study of the proper scientific operations from the point of view of protein or albuminoids, non-protein substances or fat and carbohydrates would take us too far, and it will be sufficient on this occasion to refer only to what has been found of value in actual practice. This has been concisely stated by a careful observer (Brewer) in the following words:—'The best flavoured pork and the heaviest weight of the same was obtained in cases of milk-fed swine; next to milk came the cereals—corn, barley, oats, and peas. Potatoes produced a soft, light pork, which loses a good deal in boiling. The meat of swine fed on flour mill by-products was yellow, without body, and of a poor flavour. Oil meals produced a loose, oily pork of an unpleasant flavour. Beans produced a hard, indigestible, and flavourless pork, and acorns one that was light, hard, and unhealthy'. It will be observed that milk is looked upon as being the principal mixture with cereal foods, and there is no doubt that this is the correct view to take when it is considered that dairy farming has developed so greatly within the last quarter of a century. There are now ample supplies of separated milk in all dairying countries, and this must be looked upon as being an

excellent food for swine. It is at this point that dairy farming and swine husbandry meet, and the growing of pigs seems to be the natural corollary of butter and cheese making. Summarizing the results of various observers, it may be stated here that the relation of milk and cereals for pig feeding purposes would appear to be 3 lb. of separated milk to 1 lb. of meal.

"Investigations have been made in connection with the cooking of pig foods as compared with the uncooked material, and on this branch of the subject it seems to have been shown that a considerable loss of feeding value is sustained when substances are cooked. ('Feeds and Feeding,' by Professor Henry, p. 547.) The element of digestibility, however, has to be taken into account, and there is no doubt that the growing animal assimilates cooked or moistened food more easily than dried material. It has also been shown that the investigation of the gains and weights of pigs requires considerable study. The heaviest weekly gains in weight in proportion to the food supplied are at the earlier period of existence. As the animal grows, the weekly gain gradually diminishes, while the food necessary to the upkeep gradually increases. There comes a critical point. therefore, in the fattening process, when the food consumed is not converted into flesh, and when, in fact, degeneration takes place and the feed is merely converted into the waste products of the body. The whole question, however, requires investigation in this country, and there is little doubt that if a systematic course of investigation were carried on here it would pay the farming community. It is not sufficient to have specific breeds of pigs of certain definite conformation. The question to be decided from the scientific point of view is whether these pigs are economical from the utilitarian standpoint, and it requires to be determined at what point in their life-history and in what conditions they cease to make use of the food to the best advantage. A very common ration, and one which seems to pay well for a growing pig, is 1 gallon of separated milk, 3 lb. of potatoes, 4 lb. of barley meal or equivalent. If this is given in three portions to each pig per day, starting from a weight of, say, 80 lb., and gradually fattening the animal to bacon size, it will be equal to a gain of about 15 lb. weight per week. Relatively speaking, the feeding values of various materials may be given as follows:—(1) Barley-meal, skimmed milk, and potatoes, 1000 points; (2) barley-meal and milk, 903 points; (3) maize-meal and milk, 877 points; (4) maize-meal and bean-meal, 590 points; (5) barley-meal, 519 points; (6) maize-meal and pea-meal, 489 points; (7) maize-meal, 484 points; (8) barley-meal and bran, 499 points; (9) maize-meal and bran, 404 points."

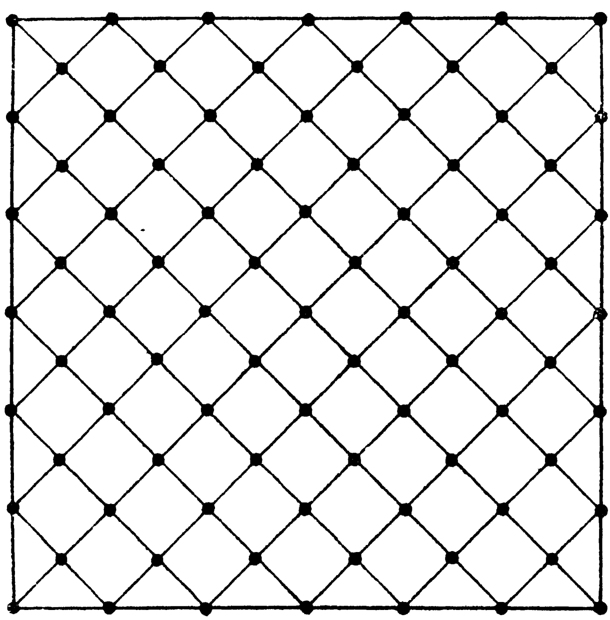
Aged Sows the Best for Breeding.

An investigation at the Iowa Experiment Station to discover the influence of the age of sows upon the prolificacy and the weight and growth of the pigs they produced gave some interesting results. It was found, for example, that fifteen sows bred at eight or nine months averaged seven and two-thirds pigs per litter, while fourteen sows about twenty-four months old averaged nine and six-tenths pigs per litter, and aged sows averaged ten and six-tenths per litter. Pigs

from the younger sows weighed on an average 2.39 lb. per pig; from the two-year-old sows 2.63, and from the aged sows 2.61 lb. When about six weeks old the pigs from the young sows made an average daily gain of .32 lb., while the pigs from the two-year-old-sows gained .40 lb. No data are given on the gain of the pigs from the aged sows. Stated in another way, it was found that the two-year-old sows farrowed 24 per cent. more pigs than the young sows, while the old sows farrowed 30 per cent. more. The weight of the pigs from the two-year-old sows was 9 per cent. greater than that of the young sows, while the pigs from the old sows were 12 per cent. larger than from the young sows. The pigs from the two-year-old sows made a more rapid gain than those from the young sows, amounting to 26 per cent. In each instance the older sows farrowed more pigs per litter, heavier pigs at birth, and their pigs made the most rapid growth after birth.—F. D. Coburn ("Swine in America").

Laying out an Orchard.

Mr. E. A. Jones, Victoria Township, Johannesburg, writes as follows, forwarding the accompanying sketch:—"The laying out of an orchard by means of wires and a piece of board is very simple, and if worked correctly would be in straight lines of any direction.



It may be a little more difficult to plan this from the outsider point of view than the old system, namely, the squares. A simple way is to make the square, mark off at equal distances right around the boundaries, then you can take a line and mark diagonal lines across from your distances on outside boundaries and where the lines cross have a peg put in. This is a great improvement on the old system,

and a greater space is given for light and air. Another way is to make your square, take four ceiling boards, and make a triangle, say, 12 ft. on each side, and cut out a semicircle at each corner. With the first attempt only half the triangle is taken, as will be seen from the diagram. First three pegs are put down, and in order that the orchard may have a regular appearance, the measurements must be correctly made."

The Desirable Hog.

The hog is the most plastic of all farm animals. In his wild state he is of unflinching gameness, an intrepid fighter, fleet as a race-horse, and almost as cunning as a fox. Our ancestors transformed him into a domestic animal, and adapted him to their use by breeding, selection, and feeding. The intelligent breeder can make from an animal so plastic about what he pleases, and the farmers have a right to demand that usefulness be the aim of every breeder and the reason for every purchase. All admire a good-looking hog, and there is no reason why good looks should not go with the highest usefulness, but neither good looks nor fancy breeding should stand for a moment in the way of the hog that combines vigour of constitution, growthiness, and reasonably early maturity, with a form pleasing to the eye of either breeder or farmer. When we come to the final test of beauty, "pretty is as pretty does". The prettiest hog, after all, is the one that is most profitable; the one that makes the most and best pounds of gain from a hundred of the most inexpensive dry matter; the one that makes the largest contribution toward providing for the family necessities; toward meeting the interest on the mortgage, and to paying the mortgage itself; for the additions to the house, the new carpet, the piano or organ, the new dresses for the girls, or for their education at school. If the breeders of any breed depart from this practical hog they make a mistake, for sooner or later the common-sense farmer will demand the common-sense hog, waiving any preference he may have for points merely fanciful.—F. D. Coburn ("Swine in America").

Cooling Iron-Roofed Buildings.

Mr. A. E. Cunningham, Sea View, P.O. Trappe's Valley, sends the following description of a cheap means of rendering iron-covered buildings cool in summer:—Procure lime, unslaked, and preferably fresh from the kiln. Mix the whole quantity to be used next day over night in a tub or half-drum; also mix separately over night, and after well crushing, twenty-four balls of common washing blue, which is to be added to the half-drum of lime-wash, thoroughly dissolved, before using. This is to improve the colour of the wash. The great thing is to keep the wash constantly stirred while using—one man being at the tub and the other on the roof the whole time. This wash is to be put on in a thick state (but well stirred). No planks or ladders must be dragged across the roof when once it has been washed with the lime, as otherwise the continuity of the wash will be broken. No size of any sort is required to be added. Slaked lime is useless as it washes off after a few showers.

Bee Plants.

The Government Botanist (Mr. J. Burtt-Davy) has received the following communication from Mr. C. Harvey, of Potchefstroom:—"As an agriculturist in a small way I was much interested by your 'Notes on Bee-keeping' in the current issue of the *Union Agricultural Journal*. A pretty garden annual much visited by bees here in January and February is *Portulaca grandiflora*, whilst the creeper known as *Maurandia* furnishes nectar almost throughout the year. *Acacia dealbata* is also a first-class honey producer."

The Trade in Ostrich Feathers.

In their weekly report for the 5th January, Messrs. Dunell, Embden & Co., the Port Elizabeth produce brokers, give an interesting table showing the weights and values (total value and average per pound) of ostrich feathers exported from South Africa since the dawn of the industry, from which it appears that the quantity produced has been rapidly increasing for some time past. In 1865, the first year recorded, the total exports amounted to 17,522 lb., having a value of £65,736, equivalent to an average value of £3. 15s. per lb. In 1875 the export had increased to 49,569 lb., at an average value per lb. of £6. 2s. 10d., the total value being £304,933. Five years later the exports had risen to 163,065 lb., valued at £883,632, or an average value of £5. 8s. 4d. per lb. In 1909, 788,111 lb. of feathers were exported, the value of these being £2,091,207 (average £2. 13s. 1d. per lb.). Last year the exports amounted to 741,078 lb., with a total value of £2,272,846, and an average value per lb. of £3. 1s. 4d. According to the table published by Messrs. Dunell, Embden & Co., the highest average value per lb. was touched in 1875 (£6. 2s. 10d.), and the lowest in 1888, when it fell to £1. 6s. 9d

The California Raisin Industry.

A statistical statement which has been issued by Mr. George Robertson, Fresno County Statistician, throws an interesting light upon the surprising growth of the Californian raisin industry and the importance of the industry to the country to-day. The first production figures recorded are those for the year 1873, when the crop amounted to 120,000 lb.; last year the crop was 112,000,000 lb. The first exports recorded are those for 1898, when 3,109,639 lb. of raisins were sent out of the country. In 1907 that figure increased to 9,128,827 lb.; in 1909 the exports amounted to 7,880,161 lb. In 1884 the value of foreign raisins imported amounted to 3,543,916 dollars; in 1909 it had fallen to 327,644 dollars, or a saving of 3,216,000 dollars to the United States. The value of Californian raisins exported increased from 139,689 dollars in 1900 to 455,657 dollars in 1909. Most of this satisfactory result must be placed to the credit of Fresno County as by far the largest producer. In 1904, according to a careful survey made by the United States Department of Agriculture, the investment in raisin and wine grape vineyards amounted at a conservative estimate to about 100,000,000 dollars (equivalent to £20,000,000). Mr. Robertson states that it has much increased since then.

Central Waterberg Farmers' Association.

Mr. B. C. Tucker, of Blindefontein, Nylstroom, Transvaal, writes announcing the formation, in January, of a society in his district under the name of the Central Waterberg Farmers' Association, with a membership of twenty-five. Mr. A. de A. Donisthorpe was elected president of the association and Mr. Tucker secretary.

A Wild Animals Poisoning Club.

Particulars have been received from the honorary secretary of the Lootskloof Wild Animals Poisoning Club (Mr. W. E. Berrington, Uitkomst, Jansenville, Cape Province) as to the operations of the club, from which it appears that the club has been in existence for about twenty-six years, and that the net numbers of carnivora which have been destroyed by the members up to the 9th November, 1910, are:—Jackals, 5794; red cats, 378; baboons, 2359; wild cats, spring hares, etc., 60.

A South African Almanack and Reference Book.

The Argus Printing and Publishing Company, of Capetown, announce that they are about to issue their "South African Almanack and Reference Book" for 1911. It will be illustrated with maps and diagrams, and will apparently constitute a great advance on its predecessors. The disadvantage under which business men and others have so long laboured is that, whenever they desire to acquire detailed information on any particular subject relating to this country, they do not know where to look for it. What is wanted is a South African "Whitaker", and this is the nature of the work which the Argus Company propose to produce. It will deal with all South African Provinces and territories, covering education, statistics, chronology, farming subjects, natural history, Civil Service, almanack information, topography, legal and financial matters, etc. A work of this nature should be welcome to all sections of the community, particularly to business men.

Correction.

The legend on Plate III, accompanying Mr. J. Burtt-Davy's article, "Notes on Crops", in the last issue, should have read "Soy Beans: Leaves and Flowers of the *Southern* Variety". The plant was erroneously described as of the *Sakura* variety.

Experiments with Ostriches—XVII.

THE FUTURE OF THE OSTRICH INDUSTRY.

By Professor J. E. DUERDEN, M.Sc., Ph.D.

(*A paper read at the meeting of the Ostrich Farmers' Association at Middelburg. 6th March,* 1911.)

IN any industry it is well that we should occasionally pause and take stock of our position, and particularly as regards the future. This applies with especial force to the ostrich industry, for in many ways it would seem to be dependent upon uncertain and changing factors. Ostrich farmers in South Africa are peculiarly isolated, and have few opportunities of meeting together to discuss the economics of their industry or keeping in touch with its progress in all parts of the world. Hence the great advantage of such an assemblage as the present, specially organized to watch over and safeguard the interests of the ostrich industry.

Now that more and more capital is being invested in the industry, that more and more are dependent upon it for their livelihoods, and that the development and prosperity of the whole farming community are largely determined by its maintenance, it becomes imperative that every care should be taken to assure continuity and success for the future. An industry which involves annually a net income to the Union of South Africa of two and a quarter millions is surely worthy of the highest consideration of our farmers, economists, and legislators. What are the actual conditions however? Each farmer, each feather buyer, each shipper is working independently. Contrary to what exists in all other industries of any magnitude, there has hitherto been no organization charged with a survey of the industry as a whole, of keeping in touch with all its ramifications, and from the knowledge thus gained of making deductions wherefrom to advise and, if possible, to regulate for the future. It was from these considerations that I welcomed the formation of this Ostrich Farmers' Association as a step towards the organization of the industry, and have advocated for several years the formation of a Government Ostrich Bureau which would give permanency and effect to the efforts of the Association. I know there are many connected with the industry, contented and happy that they are doing well, who view such efforts with indifference; they see no further than their own immediate interests, and desire to rest contented with the "well" that is and has been, going along in the hope that similar conditions will continue in the future, but putting forth no effort whatever to ensure them. This association, however, represents a different spirit in our ostrich farmers. The narrow, isolated attitude is to be replaced by one looking to the good of the industry as a whole.

As regards the special subject assigned to me, namely, the Future of the Industry, there are many considerations involved which call for discussion, and although it is always rash to make predictions, there is much that can be gained by a careful study of the past and

present situation. In the first place, I think we have already disposed of an idea at one time prevalent in the mind of those imperfectly acquainted with the subject, namely, that there is something uncertain and ephemeral connected with the ostrich industry, that an industry apparently dependent upon changes of fashion cannot have that permanency characteristic of one supplying necessary articles of consumption. The slow, gradual growth of the ostrich industry, as revealed by statistics now extending over seventy-three years, suffices to demonstrate in a most unmistakable manner that there is a permanent, unfailing, and ever-increasing demand for our product; they warrant us in regarding ostrich farming as a permanent institution and as almost peculiar to South Africa—feathers share with diamonds and gold in giving a unique character to the exports of South Africa.

Though no one now doubts that ostrich farming is a permanent feature of South African farming life, the history in the past, particularly in the early eighties and less so in the nineties, shows us that it may not always have that firmness, stability, and remunerative character which it has enjoyed for the last few years. When we contemplate the future, several disturbing factors cause us anxiety, but particularly two, namely, the danger of over-production in our midst and the growth of the industry in other parts of the world. In thinking of the vast strides being made in ostrich farming in all parts of South Africa, as a result of the prolific nature of the bird, one may well question whether the world's markets can continue to absorb such vast quantities of an article employed almost wholly for decorative purposes. Yet it is marvellous how expansive the demand has proved itself to be, for we do not forget that in 1909 the exports went ahead 21 per cent. on the previous year and still the markets remained firm. There are many who hold that vast expansions are yet possible in the use of the ostrich plume, that it has not yet conquered the whole of the western world and there still remains the Orient. With the awakening of public opinion against the destructive slaughter of other birds for their plumage, the ostrich remains pre-eminent as the bird against which there is no suspicion of ill-usage in yielding up its plumage. We can assure the Society for Prevention of Cruelty of Animals that the ostrich has the most pampered of existences. As a further argument against over-production, others point out that with the greater production and cheapening of feathers, further uses will be found for them, and I am glad to see that Mr. J. O. Collett is to submit a paper on this part of the subject.

On the whole, I must admit that at the present moment I do not regard the question of over-production as calling for alarm. There seem to be unforeseen factors working in the opposite direction, for who can satisfactorily explain the 6 per cent. diminished output of last year? There is great mortality among chicks and from an economic point of view no one would have it otherwise. What we are realizing is that prices are by no means so remunerative as formerly, and that the large profits are passing into other hands. Without involving any crisis, this fall in prices may easily have a regulatory effect, for once prices diminish, farmers will turn their attention to other stock. Looking to the future, I anticipate this is what will take place, but I am confident that it will be without any

of the disasters of the eighties. In the present ostrich development it must be admitted our farmers have proceeded on the whole very cautiously and wisely; there has been very little rash speculation, returns have gone back into property and stock improvement, and there are very few who could not advantageously direct their energies into other lines should birds prove unremunerative. I am, however, convinced that the demand is so firmly established, with reasonable care and forethought we need fear no crisis; should one come it will be due to artificial manipulation, and we need be on our guard against this.

At the present time the greatest source of profit to the ostrich farmer is in the sale of chicks and breeding birds. It may well be questioned whether this will continue so remunerative in the future. Already we find large offerings of chicks and birds. At the present moment one sees advertisements of 250, 163, and 120 chicks, and similar large numbers, showing that surplus birds are not so readily disposed of as formerly. The best breeding strains, however, show little or no reduction, and from present indications are not likely to do so.

Ostrich farming having originated in South Africa, and the country being so well adapted for it, it is natural that we should desire to retain it as a monopoly, and the discussion of this forms the second part of my paper. We know, however, that we are unable to effect anything like a complete monopoly. The Union Parliament has at the present time before it the Ostrich Export Prohibition Bill, and though farmers most emphatically desire that exportation beyond the boundaries of the Union should be prohibited, the Government has to take a wide view, and no doubt realizes how difficult it is to carry out the wishes of the farmer and prohibit the exportation to the neighbouring territories. The present is not the time to go into the many pros and cons of this much discussed question, but I am convinced of the desirability of the general principle of prohibition and should support it as far as possible. Constantly we are receiving visits from persons interested in the ostrich industry in America, Europe, and elsewhere, and one can readily understand what would happen were the exportation of birds not forbidden.

Though prohibition is working very favourably at present, the association would be under a delusion were it to imagine the industry is not progressing rapidly in countries beyond South Africa in spite of all our attempted restrictions. I hold in my hand the prospectus of a California Ostrich Company just formed in London with a capital of £240,000. They expect soon to have 5000 birds. We cannot overlook the fact that America takes nearly half of our feathers exported (£900,000), and, assisted by a protective tariff, she may soon largely supply her own needs.

We cannot therefore hope for anything like a monopoly in the ostrich industry, even if it were desirable; prohibition is at present of some service to us, but can only be regarded as an artificial temporary measure. In the end we shall have to face the competition of the world, but I do not think we need seriously fear this. We are prepared for it. Most of our farmers are now in such a position that if the ostrich industry became for the time being unremunerative they could readily direct their energies into other branches of farming, and at the same time could produce feathers at very little cost until

supply and demand had regulated prices. The quality of our birds, the adaptability of South African farming conditions, and the vast experience and resourcefulness of our farmers will always enable us to compete with other countries on a satisfactory basis, and, given a fair market, I have no fear for the future. What we do need fear are the protective tariff barriers which, if unchecked by retaliatory measures, may give an unfair advantage to our competitors. This influence, however, has not been felt by the industry up to the present, but should be noted as possibly calling for attention in the future.

In conclusion we may attempt to summarize what I have very briefly brought before you as possibly leading to discussion:—

1. I have established from the past history of the ostrich industry and its present condition that ostrich farming is to be regarded as a permanent branch of farming, and that we may expect a still increasing demand for ostrich plumes in the future.

2. Looking to the future, I only fear the possibilities of over-production and competition with other countries on an unfair basis.

3. As regards over-production there seem to be factors at work which may have a regulatory influence. Should over-production, however, reach us, it is satisfactory to reflect that it will bring no general disaster as it did in the eighties, but will simply mean the directing of our energies into other channels until supply and demand have had time to regulate themselves.

4. We do not and cannot hold anything like a monopoly of the ostrich industry, and the present benefits from prohibition can only be temporary. We must be prepared to meet competition, and on a fair basis South Africa and the South African farmer will more than hold their own.

Economics of Ornithology in South Africa.

By AUSTIN ROBERTS, Transvaal Museum, Pretoria.

THE importance of the relationship of the habits of birds to the economy of agriculture generally is yearly becoming more and more pronounced, as the country becomes more settled and scientific methods take the place of rough farming. The question is considered to be such an important one in advanced agricultural countries that it has formed the subject of special investigation, and has led to the establishment of departments to carry on research. The economic value of birds is essentially scientific from the agriculturist's point of view; but it has not been sufficiently regarded as such by ornithologists, and has therefore been somewhat neglected by that body. Farming operations have also only lately been raised to the level of a science in South Africa, and it is not until that stage is reached that the value of research in this connection is realized. Further, the separate Provinces of South Africa, hitherto lacking funds, could hardly have been expected to undertake a research such as this which affects the farming community in the whole of the country. In view of the backward state of our knowledge of the real economic value of our birds and the method of leaving the carrying out of research to private individuals not being effective, it seems to be only right, in the interests of farming at least, that a Government department should be established under Union to deal solely with this subject. At any rate such is the opinion of the South African Ornithologists' Union. A department of this nature would form a convenient centre to which all matters affecting birds in their relation to agriculture could be referred—a base for the spreading of knowledge—and its duties might be defined as follows:—

1. To prove the true economic value of birds (this is done in other countries by procuring specimens of the most important species, at all seasons of the year, and examining the contents of their stomachs).
2. To find out by inquiries in all parts of the country which species are considered to be the most troublesome, and to note changes of habits.
3. To assist in promoting the preservation of game.
4. To advise farmers as to the best method of remedying existing evils.
5. To note the dates of arrival and departure of migrants, define the distribution of species, and generally assist in the purely scientific side of ornithology, and to this end co-operate with the museums.

The development of a need for scientific investigation has taken time. Before the advent of white men in South Africa birds affected even the primitive agriculture of the natives; the patchy fields of corn had to be guarded against the same granivorous birds which now trouble us. But the conditions of that time differed widely from those obtaining now, as the grain fields were small and easily protected, and the question of obtaining and the paying of labour for the purpose had not then to be considered. The fowls and small stock

of the natives were also subjected to the attacks of birds of prey; but they were semi-wild and as well able to look after themselves as wild birds and animals, in addition to having the partial protection afforded by the presence of the owners, so they never formed the regular diet of hawks and eagles. Soon after the settlement of the country by white men a new feature arose in the introduction of cultivated fruit. Frugivorous birds, formerly dependent upon the precarious supplies of Nature, soon learned to appreciate the better quality and greater quantity placed within their reach, and it is not surprising that they forsook the wild fruit when that in the orchards began to ripen, even at the risk of being destroyed. New phases also arose as markets for the sale of produce were brought within the reach of farmers in the interior and new industries were undertaken. With these changes some birds, formerly regarded as useful, have become a nuisance, and some indigenous species have been turned to account as revenue producers. This is exemplified in the case of apiculture and trout acclimatization in the first instance, and domestication of ostriches and rearing of game birds in the second. The products of sea birds hardly enter into this discussion, although they do affect agriculture to a small extent. And the inducing of new conditions does not end at this, for we find that wherever a change takes place in the natural conditions of the country the habits of birds are affected. These changes may be due either to the advance of civilization or the failure of a natural supply of food, and, whatever they may be, they concern the farmer in one way or another. Several cases in point will be found recorded farther on, when the subject is dealt with in detail.

In Africa, wild life has become so accustomed to a strenuous fight for existence against the numerous birds and animals of prey that the changing of conditions by the closer settling of the country, and consequent thinning out of vermin, is bound to promote the increase of a great many of the smaller kinds of birds, and not always to the benefit of the farmer. Such untoward increases require to be closely watched and checked when they assume dangerous proportions.

In addition to our indigenous species we have also to take into account such as have been acclimatized and migrants which may become a pest. More outcry has been raised against the English house sparrow (*Passer domesticus*) in countries into which it has been introduced than against any of the indigenous birds. It was first introduced into the United States of America at a great many of the farming centres during the "fifties" of the last century in order to keep down grub pests; but in about twenty-five years it had become such a nuisance in other ways, and increased to such an enormous extent, that the Government was obliged to try to remedy the new evil at great expense and trouble. New Zealand and Australia have had the same experience of this bird. Although it was introduced into this country, at Durban, towards the close of the last century, it does not appear to have spread very far or made its presence felt to any great extent. That is no reason, however, for assuming that it will not become a nuisance in time to come, seeing that it has been acclimatized. The English starling (*Sturna vulgaris*) has already become a nuisance in the vicinity of Capetown, where it has been acclimatized for less than a quarter of a century. Some of our migrants may develop habits derogatory to the farmers' interests, but at present the majority are beneficial.

Such are the main general features of economic ornithology in South Africa; but, in order to better understand the whole subject, it is necessary to go into it in greater detail, and it will therefore be treated under the headings of grain, fruit, poultry, stock, and protection.

Descriptions of birds have been omitted in the majority of cases in the following pages for the sake of economy of space, and, in lieu of them, the best known names have been given, and it is hoped that for the present needs these will be sufficient. The Latin names have been taken from the Check List of South African Birds, published by the Transvaal Museum and South African Ornithologists' Union (Dr. J. W. B. Gunning and A. K. Haaguer, Esq.).

Only such species as have a direct bearing on the subject will be mentioned.

GRAIN.

Most of the damage caused to crops of grain is due to finches resident in the neighbourhood of the fields. As there are two sides to the question of the economic value of these birds it is necessary to state them both in order to show what difficulties there are in the way of remedying the evil. The farmer is faced with heavy losses sometimes when protecting the crop is difficult, to the extent of receiving no return on his expenditure and labour, or even being out of pocket, and he naturally considers that the whole tribe should be exterminated. Naturalists, on the other hand, contend "that birds are only a nuisance for part of the year, and if for the rest of the year they are doing no harm some good is bound to accrue". In examining their view we find that the birds, although doing so much harm at certain seasons, probably keep back the dangerous increase of grubs and other insect pests by feeding their young upon them, and they themselves consume large quantities of noxious grass and weed seeds. It is impossible to estimate the amount of good done by the consumption of insects—or grass and weed seeds—until systematic research provides the material to prove it. Scientists have proved to us that Nature maintains to a greater or less extent a level of good and bad qualities, and to entirely exterminate a pest always gives rise to another evil, probably as great as that previously existing. Presuming, for instance, that a certain species of finch were considered to be a greater pest than others, without research having been made into its diet throughout the year, and that it was exterminated, we should find that either another species would fill its place or its absence might lead to the increase of an insect pest or an overgrowth of noxious weeds or grass. That is no reason, however, why the evil should not be alleviated, when it becomes serious, and thinning out may be found to be necessary; but, if atempted at all, it should be done by men specially detailed for the purpose. Driving away troublesome birds is of course the best method of preventing their ravages, but this is not always possible.

It is as well, perhaps, to mention that birds in their natural conditions nearly always confine their diet to some particular class of insect, seed, or whatever it may be, and it is in this respect that systematic research is of great value.

Mealies are not subjected to so much attention from granivorous birds as smaller grain, and it is about the latter we are most concerned.

When a field of small grain has been harrowed in and the workers have gone elsewhere, birds at once appear on the scene and soon devour such of it as has not been properly covered. The following species appear at this time only, although, of course, some of those enumerated farther on also do so:—

Columba phaeonota. Rock Pigeon. (Roodpoot Bosduif.)

This species is found throughout South Africa wherever krantzes and old prospecting shafts afford them nesting sites. They are to be seen in such places during the greater part of the day, as they only go off to their feeding grounds in the early mornings and evenings. They are gregarious, and annually rear two or three broods.

Turtur semitorquata. Large Ring Dove. (Grote Torelduif.)

These doves are nearly as large as the foregoing pigeons, and frequently feed in company with them. They are locally distributed near the coast belt, but their habitat is gradually extending farther inland. So far as is known they only rear one brood annually.

Turtur capicola. Cape Turtle Dove. (Gewone Ringduif.)

This species is common throughout South Africa, and frequently rears two broods annually. It is partial to kaffir corn, perching on the waving heads to get at the grain; as a rule it feeds on the ground, and probably this is a newly developed habit. Amongst other seeds it is partial to those of the "misberiedie" weed (*Amaranthus esculentus* and spp.) and also the bulbs of the "eintje" (*Cyperus esculentus* and spp.), when they are to be found on the surface of the ground.

Turtur senegalensis. Laughing Dove. (Lemoenduif.)

This species very seldom troubles the farmer, and it plays a great part in keeping down the increase of the "misberiedie", the seeds of which form its staple diet. The fact of its being troublesome occasionally is mentioned for the reason which will be seen when the subject of protection is dealt with. It is a very common species in certain places, and sometimes rears two broods.

Heterocorax capensis. Black Crow. (Zwarte Kraai.)

Black crows are omnivorous, and both useful and otherwise. They do much damage to young mealies just appearing above ground, pulling them up in order to get at the grain concealed below, and they also sometimes pick the grain from cobs hung out to dry. On the other hand they devour a great many insects, locusts, and even carrion. One brood of from four to six is reared in the early summer months.

Anthropoides paradisea. Blue Crane. (Blauw Kraanvogel.)

Blue cranes subsist mainly upon reptiles and insects, but they also do much harm in newly-sown mealie lands, pulling up the young plants and devouring the grain thus obtained. One brood of two is reared in midsummer, the eggs being deposited on the bare ground without any effort at concealment beyond the natural colour of the eggs.

After the young grain plants have grown a few inches high and obtained a firm hold in the soil, birds are not again troublesome until the ears begin to ripen, and it is at this last stage that most damage is done.

The next few species, commonly known as "finks", have much the same habits thoughout the year, and are the worst kinds to deal with, especially those which are highly gregarious. They breed in the summer months, being then found in all moist valleys or along the banks of rivers and streams—the cocks in conspicuous brilliant-coloured plumage and the hens in a sombre brown and grey. Only one brood of from two to five young is reared annually, but probably under suitable conditions they sometimes rear more. The young birds in the nests are fed upon grasshoppers and other insects, and afterwards upon soft seeds. Until the winter months they generally keep to the neighbourhood of the breeding places and amuse themselves by constructing rough nests of strips of grass and reeds in any convenient bushes or rank growths of weeds and reeds. As the winter approaches nearer the cock birds change their bright plumage for a brown and grey similar to the hens, and the small family parties gradually join forces and form huge flocks. Towards the close of winter these flocks frequently contain tens, and even hundreds, of thousands of individuals, and when seen at a distance may be mistaken for swarms of locusts. At this season they often travel long distances in flocks in search of food, returning in the evenings to reed-beds to roost. Their food at this time of the year consists largely of grass and weed seeds. In the spring they gradually disperse in small parties to the breeding grounds.

Promelana orix. Red Bishop Bird, Red Fink. (Roodefink.)

This species is found in thousands in the vicinity of reed beds during the summer months, and when grain is cultivated near such places the greatest vigilance is necessary to save the crop from their depredations. Fifteen years ago the late Captain Baillie, of Vijfhoek, Potchefstroom, attempted to keep down their numbers by paying *a penny each* for their eggs on account of the trouble to which he was put whenever his crops showed signs of ripening. The expenditure was thrown away, however, as not only did his neighbours fail to co-operate with him—and miles upon miles of reed beds along the banks of the Mooi River, therefore, still afforded undisturbed nesting places—but his losses were not entirely due to this species, and if he had got rid of them probably other kinds would have taken their place. The nests of this fink are made of strips of reed-blades, firmly woven into an oval shape, lined with a few tops of grass and hung between two reeds or rank-weeds.

Quelea. Red-beak Fink. (Roodebek Fink.)

These consort with the last species to a certain extent, but in the winter, and when not breeding, they form flocks of their own. In some districts they are quite as numerous as the red fink. Nothing is known with certainty of their breeding habits, but it is supposed that they lay their eggs in the nests of other closely allied finks and leave the rearing of the young to the foster parents.

Pyromelana taha. Black and Yellow Bishop Bird or Golden Puff-back Fink. (Geelfink of Zwart- en Geelfink.)

This species is nowhere so common as the last two, and the flocks keep very much to themselves. Their nests are built in the grass in moist places near streams, and laid in December or January.

As this and the following species build their nests in the grass they do not necessarily frequent the neighbourhood of reed beds, although they roost in them when close at hand.

Euplectes. Large Black and Yellow Bishop Birds. (Grote Zwart- en Geelfinken.)

This genus contains several species very much alike in general appearance, and somewhat similar to the last both in plumage and habits: but the yellow feathers of the back are never erected or puffed out, and they are also larger. They are never found in large flocks of their own species, although they frequently consort with the kaffir fink and red-shouldered widow bird during the winter and non-breeding months. The eggs are two or three in number. The nests are usually placed in bunches of grass near streams running down the sides of hills and mountains.

Coliuspasser ardens. Red-collared Widow Bird or Kaffir Fink. (Kafferfink.)

This species is very widely distributed and found in great numbers in some districts. The nests are very similar to the last kind, but the choice of a site in which to build it is less restricted. The eggs are greenish-blue in colour with numerous speckles of dark brown and slate, and two or three in number.

Coliuspasser albonotatus. White-winged Widow Bird or White-winged Kaffir Fink. (Witvlek Kafferfink.)

This species is also widely distributed, but nowhere very common. The nests and eggs resemble those of the last species, but as a rule they have larger markings.

Diatropura progne. Long-tailed Widow Bird or Sakabula. (Flapfink.)

This beautiful bird is the bane of the small grain cultivator, being found both in the vicinity of reed beds and far away from them, in fact wherever there are vleis and moist valleys. It appears to be increasing in numbers, as its nest is so very cleverly concealed that finding it is quite a rare occurrence; and, except for small vermin, there is little to prevent its raising the whole brood. They are very polygamous, from six to ten hens being found to each full plumaged cock. The nests are placed in thick bunches of grass—old unburnt patches being the most favoured—the shorter tops of which are bent over and intertwined so as to hide the dry material of the nest itself, while the longer ends are allowed to remain in their normal position to preserve the natural appearance of the bunch. The cock birds are also always on the lookout for intruders, and when danger is apprehended fly around to each sitting hen to warn her, and she immediately slips off as unobtrusively as possible; the nests are therefore all the more difficult to find. The eggs are three in number, sometimes four, greenish (almost white) in colour, covered with speckles or large markings of slate-grey and brown.

Urobrachya axillaris. Red-shouldered Widow Bird. (Stompstaart Flapfink.)

This kind is rather local, and nowhere found in such numbers as the long-tailed species, but helps to swell the flocks of others previously

mentioned. Its eggs are greenish-blue with large blotches of slate-grey and brown, and usually three in number. It is rather particular as to its choice of a nesting site, preferring the long grass found growing in hollows—such as old antbear holes—near streams.

Vidua serena. Pin-tailed Widow Bird. King of Six. King Red-bead. (Hiets of Koning Roodebek.)

This species is very widely distributed, but it never forms large flocks like those previously mentioned. It deposits its eggs in the nest of some other small fink (usually the roodebekkie), destroying one of the host's eggs to make room for each of its own.

Tetraenura regia. Shaft-tailed Widow Bird. (Pijlstaartfink.)

Rather a local species, and nowhere common. Nothing has been recorded of its nesting habits.

Steganura paradisea. Paradise Widow Bird. (Paradijsfink.)

This species is only found in the hot bushveld and coast belt. It is sometimes found in large flocks. Nothing has been recorded of its nesting habits.

Ploceus (genus). Yellow Weavers. (Geel Wevers.)

Some members of this genus live exclusively in the forests, and of the rest only a few species occasionally trouble the farmer. As a class they are decidedly useful as insect destroyers. Their nests are to be seen along all streams and rivers suspended from the drooping branches of trees or woven on to two upright reeds. The eggs of some species show a great diversity of colour.

The following species do not change the colour of their plumage at different seasons, nor are they found in very large flocks, although gregarious to a certain extent:—

Passer melanurus. Black-head Sparrow. (Gewone Mossie.)

This sparrow is very prolific, frequently raising three or four broods during the year, and, being partial to the neighbourhood of towns and homesteads, it is rapidly increasing in numbers with the advance of civilization. The young birds are fed exclusively upon insects, and for the greater part of the year therefore it does not trouble the farmer. It is the individuals which have no young to care for that cause what little damage is sustained through this species.

Passer griseus. South African Grey-headed Sparrow. (Huismossie.)

This species is called the "huismossie" on account of its friendly habit of building its nest under the eaves or in holes in the walls of houses, which the last species very seldom does. Its habits closely resemble those of the black-head sparrow.

Amadina erythrocephala. Red-headed Finch. (Roodekopmossie.)

This species frequently consorts with sparrows in the vicinity of homesteads and on roadsides, but it is somewhat shyer. Civilization seems to suit this species also, and it is spreading into parts of the country where it was unknown fifteen years ago. It breeds during the winter months, occupying the disused nest of some other birds and rearing four or five young. The eggs are pure white.

Estreldinae. Waxbills or Rooibekkies. (Roodebekkies.)

Some members of this genus have become troublesome in fields of manna, but they subsist mainly upon small grass and weed seeds.

The following birds are granivorous, but so far they do not appear to have developed harmful propensities:—

Coturnix. Quails. (Quartels.)
Turnix. Button-quails. (Rietquartels.)
Textor niger. Buffalo Weaver. (Zwarte Wever.)
Plocepasser. Bower-building Finch. White-browed Weaver. (Vale Wever.)
Sporopipes squamifrons. Scaly-feathered Finch. (Baard-mannetje.)
Anaplectes. Red-headed Weavers. (Roodekop Wever.)
Amblyospiza albifrons. Thick-billed Weaver. (Dikbek Wever.)
Amauresthes fringilloides. Pied Weaver Finch. (Bontefink.)
Hypargos. Pearl-spotted Waxbills. (Perlgefleckte Fazantjes.)
Pytilia. Red-faced Waxbills. (Roodewang Fazantjes.)
Lagonosticta. Ruddy Waxbills. (Roode Fazantjes.)
Ortygospiza polyzona. Quail Finch. (Pijperje.)
Neisna. Swee Waxbills. (Swie Fazantjes.)
Uraeginthus. Blue-breasted Waxbills. (Blauw Fazantjes.)
Hypochera. Little Widow Finches. (Rouw Fazantjes.)
Passer motitensis. Greater Sparrow. (Grotemossie.)
Philetairus socius. Sociable Weaver. (Familievogel.)
Petronia. Diamond or Yellow-throated Sparrow. (Geelvlek-mossie.)
Alario. Mountain Canary. (Zwartkopje.)
Serinus and *Poliospiza*. Canaries or Seed-eaters. (Sijsies.)
Emberiza. Gold-breasted Buntings. (Geelborst Streepkopjes.)
Fringillaria. Buntings. (Streepkopjes.)
Alaudidae. Larks (some species). (Leeuweriken.)
Oena capensis. Long-tailed Dove. Namaqua Dove. (Nama-quaduifje.)

FRUIT.

The majority of frugivorous birds feed their young upon insects, and they do a certain amount of good in this respect, so that it is better to drive them away than to destroy them. Or, better still, as insects are also a pest to fruit growers, and in some places it is necessary to cover the fruit with netting, a double purpose would be served by adopting the same remedy where birds are a nuisance. When this is done there will be no need for a lecture on the destructive proclivities of frugivorous birds; but as we find the conditions, so must the subject be treated.

The amount of damage sustained depends largely upon the situation of the orchards. When they are located in the immediate vicinity of forests or places where birds can take refuge when pursued, and also build their nests in security, there it is that most damage is done. But even in the more sparsely-wooded localities in which bird-life appears to be very meagre at ordinary times, they have to be kept in check. In such places, when once a species has discovered

that a supply of fruit is obtainable and acquired the taste for it, all members of the species in the neighbourhood concentrate there and their depredations become a serious nuisance. Some species have become very precocious and persistent, and shooting them has very little effect, so that it is necessary to keep some one constantly on the watch to drive them off. For all classes of birds a shot-gun is the best weapon with which to scare them away, as the loud report, coupled with a depletion of their numbers, has great effect; but it must be used with care, or more damage will be done to the trees than is compensated for by the destruction of the birds. An air-gun merely destroys the otherwise useful birds, and they do not so soon learn to keep away.

As a rule the smaller species only rear one brood annually, but probably more when fruit is obtainable for an extended period.

Colius. Colies or Mousebirds. (Muisvogels.)

Colies are usually found in parties of from six to a dozen individuals—sometimes double that number—and are responsible for much of the damage done, both in the neighbourhood of forests and in the dry thornveld. They are essentially fruit-eaters, but sometimes vary their diet with insects. They creep about amongst the denser branches of trees (hence their name of "mousebird"), and their plumage matches the foilage so well that they are very difficult to locate. The brood of three or four is raised in the early summer months, and sometimes a second a few months later.

Pychnonotus. Blackcap Bulbuls or Toppies. (Pietkluitjekorel of Kuifkop.)

Toppies are as a rule found in the same localities as the last, and cause quite as much harm. They are found either singly or in pairs, and are very common. Their lively and friendly habits protect them wherever fruit is not a consideration, and it is a pity that they do not recognize man's ideas of "individual rights" when their craving tempts them to the orchards. They have become so accustomed to man that they are not easily scared away, but remain in the vicinity of the orchards until the opportunity is given them to return and continue their depredations. The brood consists of three.

Andropadus importunus. Green Bulbul. (Groene Bosvogel.)

This bulbul is only found in the dense forests, but when orchards are situated near such places they are very troublesome. Like the previous species their diet consists almost entirely of fruit, and, like the blackcap, two or three young form the brood.

Amydrus morio. Redwing Starling. (Roodvlerk Spreeuw.)

This species is fortunately only found in the vicinity of krantzes, but in such localities it does an enormous amount of harm, eating large quantities itself and carrying off whole fruit to feed its young. It is gregarious and raises one or two broods of four or five young annually.

Spreo bicolor. Pied Starling. (Gewone Spreeuw.)

This species is only troublesome to soft fruit such as figs and grapes, and, being gregarious, it does much damage; but its bad qualities are more than compensated for by its good ones in the destruction of locusts, termites, and ticks taken from cattle. It rears one brood of five in the spring.

Lamprocolius. Glossy Starlings. (Glansspreeuwen.)

These starlings, like the others, are very troublesome in orchards. They raise one brood of three or four in the early summer months. They are not so entirely dependent upon fruit as the redwing, and consume large quantities of insects.

Lamprotornis. Long-tailed Glossy Starlings. (Langstaart Glansspreeuwen.)

These large starlings are very shy, and do not cause very much damage.

Cinnyricinclus verreauxi. Plum-coloured Starling. (Purpur Spreeuw.)

This species is a partial migrant from the north, and as it is highly gregarious at certain seasons its habits should be closely watched in case its ordinary food supply should fail. At present it only occasionally eats fruit such as grapes, preferring wild berries when they are obtainable. Some of them are said to breed in South Africa.

Poicephalus. Parrots. (Papagaai.)

Parrots are very shy and wary, and therefore easily scared away, but they do great damage when the opportunity is given them.

Bycanistes and Lophoceros. Hornbills. (Neushoornvogels of Boskraai.)

Forest hornbills, with the exception of one species, all devour fruit when they can get it, and on account of their large size they are capable of doing great damage; fortunately they are very wary and easily scared.

Zosterops. White-eyes. (Glasoogies.)

These gentle little birds are very partial to soft fruit, and being gregarious do much harm. Their diet consists mainly of insects, especially the scale-insects (*Cocidae*).

Nectariniidae. Sunbirds or Honeysuckers. (Suikerbekjes.)

Some members of this family are very fond of the juice of soft fruit, using their sharp beaks to great purpose.

The following birds are frugivorous, but so far have not become very prominent in orchards:—

Musophagidae. Lories. (Louries.)
Capitonidae. Barbets. (Stombek Houtkappers.)
Vinago. Fruit Pigeons. (Groenduiven.)

Turturoena delagorguei. Crimson-winged Pigeon. (Papagaaiduif.)

This species is rare, but is said to be troublesome to fruit growers in the northern Transvaal and on record as being partial to mulberries near Durban.

Sylvia. Willow Warbler and Common White-throat. (Tuinfluiter en Grasmeerle.)

These two warblers are very partial to soft fruit, but not common enough to be considered seriously.

Columba arquatrix. Rameron or Olive Pigeon. (Geelpootbosduif.)

This pigeon is highly gregarious, migrating to all parts of the country in search of its favourite food. At present its diet is largely confined to wild chestnuts and berries of different species of the "stinkhout" tree. No doubt when new kinds of fruit are introduced into the country some of them will be found to suit its taste, and it will then become a serious nuisance.

POULTRY.

The question of the economic value of our birds of prey is a very vexed one. The destruction of our troublesome classes of hawks and eagles is bound to follow the advance of civilization, and we have to consider what the effects will be upon the increase of small mammals and birds which, under natural conditions, have become prolific enough to make up for the lessening of the numbers by the attacks of these so-called larger vermin.

The kinds which never attack poultry are very few and easily enumerated. Others again only occasionally become troublesome, and all of them, including the very troublesome kinds, do a large amount of good in keeping down the increase of small vermin, such as rats and mice, and locusts, termites, and other pests. The only practical remedy appears to be to educate the people most concerned to a knowledge of the names and habits of all species, as they would then be able to distinguish between the most troublesome kinds and those which are quite harmless, and in this way partly promote the increase of the useful kinds to make up for the destruction of the individuals which have developed a taste for poultry. The destruction of hawks of all kinds is being carried on by every one who attempts to rear poultry outside towns, and it is time that legislation should be brought to bear on it. The main difficulty lies in the fact that the farmer cannot be expected to tamely submit to the depredations of birds of prey without retaliating, but it is carried too far very often, and anything having the semblance of a "hawk" is ruthlessly destroyed without first considering whether it is a useful species or not. Of course poultry can be protected by wire-netting, but the small farmer is not always in a position to be able to purchase it, and there is also another consideration to be taken into account, i.e. game in the wild state. This last makes the question still more complex, as there is no means of protecting game from the attacks of vermin except by getting rid of the most destructive kinds, and the results of doing so will seriously affect other interests. At present the country is not in a position to undertake the destruction of any class of bird, and it will have to remain over until a sounder knowledge of their habits has been obtained. Hawks are frequently so much alike in general appearance that mistakes are often made in identity and the wrong birds destroyed, especially as a close view of them is seldom possible. For this reason also it is difficult to obtain authentic information regarding their destructive propensities, and some kinds get the blame for the damage caused by others. All the troublesome kinds of hawks are most in evidence when they have young ones to provide for, some kinds never venturing near poultry yards except at this time.

Owls are able to keep down the increase of nocturnal vermin, which can hardly be got at except through them, so they should be

strictly protected. Three of the larger species are said to prey upon sleeping poultry, but farmers themselves are responsible for losses from this cause in not having provided proper roosting places.

The following species are most in evidence as poultry thieves:—

Astur melanoleucus. Black Sparrowhawk. (Bonte Sperwer.)

A migratory species which is very destructive to poultry during the summer months in the forested regions near the coast of Natal and Cape Colony.

Astur tachiro. African Goshawk. (Zuidafrikaans Havik.)

A wily and daring chicken thief, and a resident in the dense forest regions of South Africa. It breeds in the spring or early summer months, and is then particularly troublesome.

Astur polyzonoides. Little Banded Goshawk. (Veelbandige Havik.)

This little species takes the place of the last in the thornveld, and in spite of its small size does considerable damage to small and half-grown chickens.

Accipiter rufiventris. Red-breasted Sparrowhawk. (Roodeborst Sperwer.)

A small but daring poultry thief, resident in the dense forests. It breeds in South Africa during the early summer months.

Accipiter minullus. Little Sparrowhawk. (Kleine Sperwer.)

This species is found in all wooded parts of the country, and is a daring chicken thief, appearing like a flash from the forest, seizing its prey and dashing back again before the astounded spectator has had time to realize its presence. It also breeds in South Africa.

Micronisus gabar. Gabar Goshawk. (Blauwe Sperwer.)

This species is distributed all over Africa in wooded localities, and is a resident. It is reputed to be partial to chickens in the Northern Transvaal, but it may have been mistaken for another species.

Micronisus niger. Black Goshawk. (Zwarte Sperwer.)

This species is rather rare, and is found in the thornveld. It is very troublesome in the bushveld of the Transvaal.

Falco peregrinus. Peregrine Falcon. (Slechtvalk.)

A migrant from Europe and North Africa, and rather rare in South Africa. It is a highly predatory species.

Falco minor. South African Peregrine Falcon. (Kleine Slechtvalk.)

This species is a resident in South Africa, and a local representative of the last.

Falco biarmicus. South African Lanner. (Zuidafrikaanse Edelvalk.)

A very common species, found in the inland districts of South Africa, where it is resident and breeds. It is a powerful bird and very destructive to poultry.

Buteo desertorum. Steppe Buzzard. (Vaale Arend.)

A very common species found throughout Africa, Western and Southern Asia, and Southern Europe, and a migrant to South Africa. It only carries off *young* poultry.

Spizaetus coronatus. Crowned Hawk Eagle. (Gekroonde Arend.)

A powerful and very destructive eagle which is confined to the forest regions of Natal and Cape. It breeds during the spring, building a large nest of sticks, lined with green leaves, on the fork of a large tree, usually in a secluded part of the forest.

Spizaetus bellicosus. Martial Hawk Eagle. (Breedkop Arend.)

This eagle is quite as destructive as the last and is more widely distributed, being found in the dry thornveld of the interior as well as in certain localities near the coast. It breeds in the Orange Free State and Transvaal, constructing a large nest of sticks, lined with green leaves, on the top or topmost branches of an isolated thorn or other large tree. Only one egg is laid in the winter months.

Hieraaetus spilogaster. African Hawk Eagle. (Honderjager.)

This eagle is distributed over the greater part of the eastern portion of Africa, but is rather rare in South Africa. It is usually found in the vicinity of mountains in the interior, and has been known to breed in Rhodesia. It frequently carries off full-grown fowls.

Aquila rapax. Tawny Eagle. (Roofarend of Kouwvogel.)

A powerful and common eagle, distributed throughout the greater part of Africa, and a resident in South Africa. It builds its nest as a rule on the top of a camel-thorn tree and lays two eggs during the winter months.

Milvus aegyptius. Egyptian Kite. (Geelbek Wouw.)

This species is a migrant scavenger from Northern Africa, Southern Europe, and Asia, and sometimes breeds within the South African limits. It is very common during the summer months, and is very partial to young chicks when its ordinary food is difficult to get.

Melierax canorus. Chanting Goshawk. (Grote Gebandige Blauwvalk.)

This hawk is a fairly common resident of the drier districts of South Africa, and does much damage.

Circus pygargus. Montagu's Harrier. (Blauw Kuikendief.)

This harrier only occasionally troubles the poultry farmer, carrying off chickens when the owners are not in the vicinity. It is a migrant from Europe and Asia, where it breeds, and is fairly common in South Africa during the summer months.

The following species are not in the habit of attacking poultry, and only occasionally carry off stray chickens:—

Circaetus pectoralis. Black-breasted Harrier Eagle. (Uilarend.)

Circaetus fasciolatus. Banded Harrier Eagle. (Gebande Uilarend.)

These two species are large enough to do considerable damage, and they are reputed to attack even sheep. But probably they have been confused with some other eagle, as the evidence adduced from the examination of the stomachs of individuals points to their subsisting mainly upon reptiles, termites, and such like small fry. They hover high over their quarry like kestrels and the black-shouldered kite.

Kaupifalco monogrammicus. African Buzzard Eagle. (Blauw Streepvalk.)

This species is also reputed to attack poultry, but probably it has been mistaken for some of the troublesome kinds which closely resemble it. It lives mainly on scorpions, centipedes, termites, beetles, locusts, and small birds and mammals.

Polyboroides typicus. Harrier Hawk. (Grote Blauwvalk).

This hawk closely resembles the secretary bird, but it is smaller and does not keep to the ground. The natives state that it is very partial to dassies (*Procavia*), and it certainly is found in the vicinity of their haunts; but it is very shy, and little has been recorded of its habits.

Circus. Harriers. (Kuikendieven.)

Harriers are harmless and useful birds, except during the breeding season, when they are more venturesome and carry off young chickens to feed their brood. Their diet is mainly comprised of mice, reptiles, insects, and sometimes small birds.

Baza verreuxi. Cuckoo Falcon. (Koekoekvalk.)

This is a rare species, and little has been recorded of its habits.

Scotopelia peli. Pel's Fishing Owl. (Visuil.)

A very rare species found near streams along the coast belt. It is reputed to carry off game birds such as guinea-fowl.

Bubo lacteus. Giant Eagle Owl. (Reuzen Ooruil.)

A rather rare but widely distributed species, found in the thorn-veld. It is very destructive when once it has located roosting poultry, returning night after night until it is shot or scared away.

Bubo capensis. Cape Eagle Owl. (Kaapse Ooruil.)

This species also has the reputation of being destructive to roosting poultry. It is confined to Cape Colony and Natal, where it is common.

STOCK.

Small stock farming as affected by birds might well have been included under the heading of poultry, as the large eagles which attack sheep also carry off poultry; but in other respects there is a distinct difference, and it is more convenient to treat them separately.

Large stock is affected beneficially only, certain birds ridding them of parasites.

A change in habits, due to the advance of civilization, is noticeable in the case of two of our scavengers having taken to killing sickly sheep and lambs in the absence of carrion. This development is due either to an increase in their numbers consequent on the abnormal amount of food obtainable during the late war, or the fact of animals which have died of disease having been buried to prevent infection. The common vulture was known to attack sheep before the war, however, and it had already ceased to be protected by law by that time, so that the history of this development must be traced farther back. In former times South Africa was overrun with the larger antelopes and other big game, and carnivorous animals preying upon them did not consume all of what they killed. Then the white

hunter appeared, and large numbers of animals were killed for the sake of their hides and the carcasses left to rot in the veld or be devoured by scavengers; but when the game had been driven out of the settled districts vultures were left without their means of subsistence. Most of the destruction caused by vultures is recorded from the neighbourhood of the krantzes in which they breed, and it is not unlikely that they only do so when they have young ones to provide for and cannot travel great distances in search of carrion. It was not until quite recently that the white-necked raven took to attacking sheep, and it is quite an unexpected departure from their usual habits. Probably the development is due to the same cause as in the other case, and it goes a long way to prove what has been said by scientists that "changes of the natural conditions induce new habits in the fauna of a country".

There has been a very noticeable decrease in numbers of the larger eagles since the country has become more closely settled. This is due to the unrelenting extermination that has been carried on by small stock farmers. One cannot help regretting the loss of these magnificent birds, but in this utilitarian age there is no help for it.

The following birds are beneficial to the stock farmer:—

Buphagidae. Oxpeckers. (Rhenostervogels.)

These birds are locally distributed in the neighbourhood of places where buffaloes and rhinoceroses were formerly to be found. They live entirely upon parasites taken from animals, crawling all over their bodies and clinging on in any position, while the animals calmly allow them to do so without molestation. They are said to peck at sores on stock, keeping them open in order to obtain the blood which exudes; but this habit is amply compensated for in the destruction of ticks.

Bubulcus ibis. Buff-backed Egret. (Bosluisvogel.)

This egret depends largely for its food on the ticks which fall from cattle when grazing. The young are fed principally upon grasshoppers and locusts. They are very common in some districts, and large flocks of them are often to be seen at great distances from the reed beds in which they roost. They breed in companies, hundreds of their nests being placed close together in reed beds and vleis.

Corvus scapulatus. Pied Crow. (Bonte Kraai.)

This crow somewhat resembles the white-necked raven; but it is smaller and has the whole of the under surface of the body white and a white collar round the back of the neck, whereas the raven has only the white collar, and the under surface of the body is black. It does not make a practice of picking ticks from cattle, and only does so when other food fails. Like the black crow, it is omnivorous.

Spreo bicolor. Pied Starling. (Witgat Spreeuw.)

This starling also occasionally picks ticks from cattle. It has already been mentioned under fruit.

The following kinds are troublesome to small stock farmers:—

Spizaetus bellicosus. Martial Hawk Eagle. (Breedkop Arend.)

This species often attacks sheep, and does much damage. It has been mentioned under poultry.

Spizaetus coronatus. Crowned Hawk Eagle. (Gekroonde Arend.)

Also a destructive species, and mentioned under poultry.

Aquila verreauxi. Black Eagle. (Zwarte Arend of Dassievanger.)

This eagle lives in mountainous parts of the country, where it lives principally upon dassies; it sometimes attacks sickly sheep and lambs.

Aquila rapax. Tawny Eagle. (Roofarend of Kouwvogel.)

This species subsists largely upon meercats and other small mammals, sometimes attacking sickly sheep and lambs, and it does not despise carrion.

Gypaetus ossifragus meridionalis. Southern Lammergeier. (Lammervanger.)

This species is said to be troublesome to small stock farmers in the mountainous parts of the country it inhabits, but its natural food is carrion and bones.

Gyps kolbei. Common Vulture. (Gewone Aasvogel.)
Corvultur albicollis. White-necked Raven. (Withals Kraai.)

These last two are scavengers, and have already been mentioned in my opening remarks. Both species build their nests on ledges of krantzes.

SCAVENGERS.

In view of the changes which have taken place in the habits of two scavengers, it will be as well perhaps to mention the others in case they should also develop destructive propensities:—

Otogyps auricularis. Black Vulture. (Zwarte Aasvogel.)

This species is rare and shy, and seldom condescends to feed in company with the other kinds, for which reason—and because the others will not venture near a carcass when a black vulture is feeding—it is often called the "king vulture". I have seen it devouring meercats, but cannot vouch that it killed them itself.

Lophogyps occipitalis. White-headed Vulture. (Witkop Aasvogel.)

This is a rare species, only found in the northern parts of South Africa; beyond our limits it extends into North Africa.

Gyps ruppelli. Ruppell's Vulture. (Ruppell's Aasvogel.)

Another North African species sometimes found in South Africa.

Pseudogyps africanus. White-backed Vulture. (Witrug Aasvogel.)

This species closely resembles the common vulture at a distance, but is generally darker in colour and shows a white patch down the back when in flight. It builds its nest in trees, and not in krantzes.

Neophron percnopterus. Egyptian Vulture. (Egyptise Aasvogel.)
Neophron monachus. Hooded Vulture. (Monnik Aasvogel.)

Both rare visitors from the north.

Helotarsus ecaudatus. Bateleur Eagle. (Berghaan.)

This eagle feeds principally upon carrion; at other times upon reptiles and small mammals.

Leptoptilos crumenifer. Marabou Stork. (Afrikaansche Maraboe.)

This stork is very shy, and with the advance of civilization has retreated farther north, though it sometimes returns for a short time when carrion is obtainable in large quantities, such as during the late war.

Milvus aegyptius. Egyptian Kite. (Geelbek Wouw.)

This bird has been mentioned under poultry. Its ordinary food is refuse and carrion.

Corvus scapulatus. Pied Crow. (Bonte Kraai.)

The pied crow has been mentioned as a benefactor to stock.

Heterocorax capensis. Black Crow. (Zwarte Kraai.)

This crow has been mentioned under grain. It is usually the first to notice a dead animal, and picks out the eyes before the larger scavengers appear on the scene.

Haliaetus vocifer. Sea Eagle. (Zee Arend.)

Although the diet of this eagle is essentially fish, it does not despise carrion when pressed by hunger.

PROTECTION.

Three Provinces of the Union have seen the necessity of adopting protective legislation in the interests of birds other than game; but they are not consistent, and there seems to be a division of opinion as to what kinds should be protected. In Cape Colony protection is left in the hands of municipal or district officials, each district having a list of its own. This is decidedly a good method, as most of the wanton destruction of birds is done by boys. In Natal one list of protected birds serves for the whole Province, but, like those of Cape Colony, too many species are enumerated and a great many of them are not wholly useful. In the Transvaal only locust and tick birds, and two other kinds which it was feared might be exterminated, are protected, and a few more might well be added to the list.

In reviewing the lists published in Natal and Cape Colony several kinds are found enumerated that might well be excluded on account of their being partly harmful. Some species of turtle doves are troublesome to grain growers; white-eyes are partial to soft fruit; kingfishers prevent the increase of acclimatized fish; and drongho shrikes are a nuisance to apiculturists. These are not all of them, but sufficient to show that the subject has not been universally examined from all points of view.

For the present protection should be given to such kinds as are known to be wholly useful, and, seeing that so little is known about birds by people generally—including the police—to those only which would be easily recognized by everybody. Wholly useful kinds, and those which are not, are frequently so much alike in general appearance that they are not easily distinguished from each other by any but the trained naturalist. To protect all such kinds means involving the legal authorities in the technique of ornithology, and to avoid this a great many offenders are sure to be let off. On the other hand, if a few well-known and really useful birds are protected the law is sure to carry more weight, and protection would have the desired effect. There is no fear of immediate extermination of any of our

useful birds which do not come within the jurisdiction of the law, and in a few years, when more has become known about birds and their habits, others can be added to the list.

Only wholly useful birds should be protected, because farmers and others must be allowed to protect their own interests, and if a saving clause is inserted in the law allowing them to do so as likely as not it would be abused and made an excuse for wantonly destroying other really useful kinds. For injuring well-known and decidedly useful birds there can be no excuse. The export of plumes of any but domesticated birds for the purpose of trade should be strictly prohibited.

A great deal of ignorance exists amongst people who have birds constantly before them both as to their names and habits, and new-comers, anxious to learn something about them, have the greatest difficulty in eliciting information. This is natural when it is considered how little encouragement has been given to children to study them, and the lack of popular literature on the subject. South Africa is a young country in which few people have had the time to undertake the study, except a few naturalists and collectors who were more concerned with the scientific and profitable side of the question, and the result is that we have not got enough simple and popular books within the reach of all to encourage it. The best means of promoting the study would be to introduce it into the schools. Doing so would not only produce universal knowledge of this interesting subject; but it would also assist a practical purpose in affording proper protection to useful birds. The more that is known about our birds the greater will be the benefit to the country.

The following birds are suggested for protection:—

As Friends of the Stock Farmer.

Buphaga. Oxpeckers. (Rhenostervogels.)
Bubulcus ibis. Buff-backed Egret. (Bosluisvogel.)

As Consumers of Locusts and Termites.

Glareola. Pratincoles or Locust-birds. (Sprinkhaanvogels.)
Ciconia ciconia. White Stork. (Grote Sprinkhaanvogel of Wit Ooievaar.)
Ciconia nigra. Black Stork. (Grote Zwart Sprinkhaanvogel of Zwarte Ooievaar.)
Creatophora carunculata. Wattled Starling. (Lelspreeuw of Vaalspreeuw.)

As Small Vermin and Insect Destroyers.

Cerchneis. Kestrels. (Roodevalken of Steenvalken.)
Elanus caeruleus. Black-shouldered Kite. (Blauw Valkje of Wit Sperwer.)
Strigidae. Owls. (Uilen.) Except the three largest species.)

As Insect Destroyers.

Hirundinidae. Swallows. (Zwaluwen.)
Macropterygidae. Swifts. (Windzwaluwen.)
Motacillidae. Wagtails. (Kwitjes.)

As being Beautiful and likely to be Exterminated.

Balaerica regulorum. Crested Crane. (Mahem.)
Coraciidae. Blue Jays or Rollers. (Trouwpanden.)

An Investigation into the Fermentation of Grape Must.

By J. LEWIS, M.A., D.Sc., Assistant Analyst (Cape).

THE investigation the results of which are herein discussed had for its object the study of the course of fermentation in ordinary viticultural practice with particular reference to the relative rates of formation of alcohol and glycerine, the relative rates of fermentation of dextrose and levulose, and the relation between the sugar destroyed and the alcohol formed. In order to arrive at more definite conclusions on these points by the elimination of certain variable factors, a further series of researches was made on the vinous fermentation of sterile must by a selected yeast.

PRACTICAL FERMENTATIONS.

The practical fermentations were made at Groot Constantia during the vintage of the year 1910. The musts dealt with were:—

A—White French.
B—Hermitage.
C—White French.
D—Riesling.
E—Hermitage.
F—Cabernet Sauvignon.

In the case of the white vintages, A, C, D, the grapes were crushed in a centrifugal crusher and the must fermented in square cement tanks 4 ft. deep and 56 square ft. in area. The air temperature during fermentation was frequently extremely low for South African practice, the minimum temperature being 13° C., and in all three cases the fermenting musts were racked into closed wooden vats placed in a storage cellar whose temperature was more uniform, where the primary fermentation was completed.

In the case of C and D the musts were blended with others before fermentation was finished, and consequently the investigation could not be carried out in its entirety in these cases.

For the red wine vintages, B, E, F, the grapes were crushed, the stems separated, and the pulp fermented in cement tanks 3 ft. 6 in. deep and 56 square ft. in area.

LABORATORY FERMENTATIONS.

In order to eliminate the disturbing influence of bacterial growth and varying temperature, and to avoid loss of alcohol, several fermentations were made in the laboratory, using in each case the same sterilized grape must, containing 25 per cent. of sugar and a selected levure,* of which approximately the same quantity was taken in each case. An addition was made to the must of .01 per cent. of ammonium phosphate and sufficient tartaric acid to bring the acidity

* The yeast was obtained from the Institut La Claire, Morteau, France.

up to .66 per cent. (calculated as tartaric acid). A measured volume of must (about 2 liters) was placed in a large flask, sterilized by heat, and seeded with the yeast. The flask was closed with a bored rubber stopper through which were introduced (*a*) a thermometer; (*b*) a syphon tube for drawing off samples; (*c*) an air inlet for the introduction of sterilized air during sampling; (*d*) an exit tube for the escape of carbon dioxide. This exit tube was connected with an absorption flask kept cool by ice, and a spiral condenser in order to intercept the alcohol carried off from the must.

The must having been aerated with sterilized air, the fermentation flask was placed in a large water bath which was heated by a low temperature burner provided with a thermo-regulator by which means the temperature inside the flask was kept constant to within 1° C. Samples for analysis were drawn daily.

The following fermentations were conducted:—

K_1, K_2, duplicate fermentations at 29-30° C.

L_1, L_2, duplicate fermentations at 24.5-25.5° C.

M, one fermentation at 29-30° C., the must being periodically treated with alcohol. The alcohol was added to the fermenting must on each day, except the first, immediately after a sample had been drawn for analysis, the amount added being exactly sufficient to increase the alcohol by 1 per cent. by volume.

THE FERMENTATIONS AT GROOT CONSTANTIA.

The following is a tabular statement of the temperature of the fermenting-house and of the musts during the fermentations A-F*:—

Date.	Temperature of Cellar, in degrees Centigrade.	Temperature of Musts, in degrees Centigrade.					
		A	B	C	D	E	F
March 14 ...	19·0	22·5	—	—	—	—	—
„ 15 ...	17·5	21·5	—	—	—	—	—
„ 16 ...	17·0	20·5	23·0	—	—	—	—
„ 17 ...	16·0	19·0†	18·5	—	—	—	—
„ 18 ...	14·0	22·0	20·0	—	—	—	—
„ 19 ...	13·0	22·0‡	21·0	—	—	—	—
„ 20 ...	15·0	22·5	30·0	—	—	—	—
„ 21 ...	16·0	24·0	30·0	22·0	22·0	—	—
„ 22 ...	19·0	27·0	30·0	20·0	20·0	22·5	22·0
„ 23 ...	19·0	26·0	—	20·0	21·0	23·5	22·5
„ 24 ...	18·5	26·0	—	20·0‡	23·0‡	24·0	24·0
„ 25 ...	—	23·5	—	21·0	24·0	27·0	26·0
„ 26 ...	—	—	—	22·0	25·5	31·0	28·0
„ 27 ...	—	24·0	—	23·5	27·5	32·0	30·0
„ 28 ...	—	—	—	24·5	27·5	31·5	—
„ 29 ...	—	22·0	—	26·5	27·0	—	—
„ 30 ...	—	22·0	—	29·0	26·5	—	—
April 4 ...	—	21·0	—	—	—	—	—

* Temperatures taken about 9 a.m.

† Must heated to 25° C. the following night.

‡ Racked into closed wooden vats in storage cellar the temperature of which remained 19–21° C. throughout the period of fermentation.

ANALYSIS OF THE MUSTS.

The following tables, A to F, give the analysis of these musts at intervals during the fermentation. Where not otherwise stated, quantities are in grammes per 100 cubic centimetres. As the method for the determination of dextrose and levulose is not sufficiently accurate to enable correct conclusions to be drawn from small quantities of sugar consumed, I have restricted my analysis of the sugar to dates between which considerable quantities had been fermented.*

In addition to the invert sugar, dextrose, levulose, alcohol, and glycerine, I have calculated, *for the periods between successive samplings*, the ratios (1) between sugar fermented and alcohol produced, (2) between dextrose and levulose fermented, (3) between glycerine and alcohol formed.

A—*White French.*

Number of days after vat was filled	0	5	8	10	13	16	21	
Sugar	19·21	16·76	12·75	10·18	6·41	3·03	·73	
Dextrose	9·74	—	6·13	—	—	1·11	—	
Levulose	9·45	—	6·64	—	—	1·96	—	
Alcohol, vol. per cent.	·03	1·34	3·64	5·06	7·07	9·02	10·40	
Alcohol, gms. per 100 c.c. ...	·02	1·06	2·89	4·02	5·61	7·16	8·26	
Glycerine	·034	·184	·385	·498	·605	·717	·772	*Mean.*
Alcohol, per 100 of sugar fermented	—	42·4	45·6	43·9	42·2	45·9	47·8	44·6
Levulose fermented, per 100 dextrose	—	—	77·8	—	—	93·2	—	86·0
Glycerine formed, per 100 alcohol	—	14·0	11·0	10·0	6·7	7·2	5·0	9·0

B—*Hermitage.*

Number of days after vat was filled	0	2	3	4	6	
Sugar	22·03	16·80	14·85	8·86	·22	
Dextrose	11·08	—	7·07	3.84	—	
Levulose	10·95	—	7·87	5·07	—	
Alcohol, vol. per cent.	nil	3·01	4·00	7·60	12·89	
Alcohol, gms. per 100 c.c. ...	nil	2·39	3·18	6·03	10·19	
Glycerine	·044	·482	·594	·846	1·164	
Alcohol formed, per 100 sugar fermented	—	45·7	40·5	47·6	48·1	*Mean.* 46·7
Levulose fermented, per 100 dextrose	—	—	76·8	86·7	—	81·2
Glycerine, per 100 alcohol ...	—	18·3	14·2	8·9	7·6	10·9

* Sugar was determined gravimetrically, dextrose and levulose by Sarchlet-Sacchse's method, and glycerine by the method of Zeisel and Fanto as modified by Stritar (Zeit. fur An. Chemie, 1903, pp. 549 and 579).

C—*White French.*

Number of days after vat was filled	0	3	6	9	
Sugar	20·10	16·29	9·86	5·68	
Dextrose	10·33	8·15	—	1·86	
Levulose	9·76	8·15	—	3·88	
Alcohol, vol. per cent.	nil	2·12	5·85	8·22	
Alcohol, gms. per 100 c.c. ...	nil	1·68	4·65	6·53	
Glycerine	·020	·339	·662	·805	*Mean.*
Alcohol formed, per 100 of sugar fermented	—	44·1	46·2	45·0	45·3
Levulose fermented, per 100 dextrose	—	73·9	—	67·9	69·4
Glycerine formed, per 100 alcohol	—	19·0	10·9	7·6	12·0

D—*Riesling.*

Number of days after vat was filled	0	3	5	6	7	9	
Sugar	21·54	20·14	17·76	10·33	5·77	3·38	
Dextrose	10·58	—	8·52	4·44	—	·78	
Levulose	10.97	—	9·27	5·94	—	2·62	
Alcohol, vol. per cent.	·10	·86	2·14	6·47	9·17	10·69	
Alcohol, gms. per 100 c.c. ...	·08	·68	1·70	5·14	7·28	8·49	
Glycerine	·027	·180	·342	·774	·897	·933	*Mean.*
Alcohol, per 100 sugar fermented	—	41·7	42·8	46·3	46·9	50·6	46·3
Levulose fermented, per 100 dextrose	—	—	82·5	81·6	—	90·7	85·2
Glycerine formed, per 100 alcohol	—	25·2	15·0	12·5	5·7	3·0	10·8

E—*Hermitage.*

Number of days after vat was filled	0	2	3	5	
Sugar	21·34	19·77	8·86	·150	
Dextrose	10.64	—	3·88	—	
Levulose	10·71	—	5·03	—	
Alcohol, vol. per cent.	·15	1·04	7·33	12·42	
Alcohol, gms. per 100 c.c. ...	·12	·83	5·82	9·86	
Glycerine	·054	·194	·732	1·005	*Mean.*
Alcohol, per 100 sugar fermented	—	45·2	45·7	46·4	46·0
Levulose fermented, per 100 dextrose	—	—	84·0	—	84·0
Glycerine formed, per 100 alcohol	—	19·9	10·8	6·7	9·8

F—*Carbernet Sauvignon.*

Number of days after vat was filled	0	2	3	5	
Sugar	24·02	18·40	11·13	·47	
Dextrose	12·06	9·10	5·14	—	
Levulose	11·95	9·31	6·03	—	
Alcohol, vol. per cent.	nil	3·36	7·36	13·53	
Alcohol, gms. per 100 c.c. ...	nil	2·67	5·84	10·74	
Glycerine	·015	·380	·739	·992	*Mean.*
Alcohol, per 100 sugar fermented	—	47·5	43·6	45·9	45·7
Levulose fermented, per 100 dextrose	—	89·2	82·8	—	85·5
Glycerine formed, per 100 alcohol		13·7	11·3	5·2	9·1

The following tables, K_1, K_2, L_1, L_2, M, give the results obtained by an examination, on the same lines as above, of the products of fermentation of a sterile must fermented with a selected levure.

K_1, K_2, were fermentations at 29-30° C.

L_1, L_2, were fermentations at 24.5-25.5° C.

M was a fermentation at 29-30° C., 1 per cent. of alcohol being added to the must at four successive daily intervals commencing twenty-four hours after the must was seeded with yeast.

K_1—*Fermentation at* 29-30° *C.*

	Original Must.	After 1 day.	After 2 days.	After 3 days.	After 4 days.	After 5 days.	
Sugar	25·15	21·76	14·58	6·21	2·15	·22	
Dextrose	12·54	—	7·19	—	·70	—	
Levulose	12·61	—	7·40	—	1·53	—	
Alcohol, vol. per cent.	nil	1·90	6·03	11·10	13·49	14·67	
Alcohol, gms. per 100 c.c. ...	nil	1·51	4·79	8·81	10·71	11·65	
Glycerine	·0188	·402	·932	1·268	1·391	1·442	*Mean.*
Alcohol, per 100 sugar fermented	—	44·6	45·7	48·0	46·8	49·2	46·7
Levulose fermented, per 100 dextrose	—	—	97·4		90·4	—	93·6
Glycerine formed, per 100 alcohol	—	24·7	16·2	8·3	6·5	5·4	12·2

K_2—*Fermentation at* 29-30° *C.*

	Original Must.	After 1 day.	After 2 days.	After 3 days.	After 4 days.	After 5 days.	
Sugar	25·32	21·60	14·37	6·02	1·84	·17	
Dextrose	12·64	—	—	2·65	—	—	
Levulose	12·68	—	—	3·40	—	—	
Alcohol, vol. per cent.	nil	2·09	6·02	11·14	13·55	14·70	
Alcohol, gms. per 100 c.c. ...	nil	1·66	4.78	8·83	10·76	11·67	
Glycerine	·0204	·435	·952	1·284	1·402	1·438	*Mean.*
Alcohol, per 100 sugar fermented	—	43·0	43·2	48·8	45·7	54·5	46·4
Levulose fermented, per 100 dextrose	—	—	—	92·9	—	—	92·9
Glycerine formed, per 100 alcohol	—	24·9	16·5	8·2	6·0	4·0	12·2

L_1—*Fermentation at 24·5–25·5° C.*

	Original Must.	After 1 day.	After 2 days.	After 3 days.	After 4 days.	After 5 days.	After 6 days.	After 7 days.	After 8 days.	After 9 days.	
Sugar	25·26	23·91	21·68	18·21	12·77	7·80	4·94	2·86	1·38	·37	
Dextrose	12·58	—	—	8·82	—	3·20	—	—	—	—	
Levulose	12·64	—	—	9·39	—	4·65	—	—	—	—	
Alcohol, vol. per cent....	nil	·77	2·01	3·99	7·30	10·24	11·94	13·25	14·17	14·80	
Alcohol, gms. per 100 c.c.	nil	·61	1·60	3·17	5·80	8·13	9·48	10·52	11·25	11·75	
Glycerine	·0196	—	·385	—	·874	—	1·093	—	—	1·147	*Mean.*
Alcohol, per 100 sugar fermented	—	45·2	44·4	45·2	48·4	46·8	47·2	50·0	49·3	49·5	47·2
Levulose fermented, per 100 dextrose ...	—	—	—	86·4	—	84·3		—	—	—	85·2
Glycerine formed, per 100 alcohol	—	—	22·3	—	11·9	—	6·0	—	—	2·4	9·6

L_2—*Fermentation at 24·5–25·5° C.*

	Original Must.	After 1 day.	After 2 days.	After 3 days.	After 4 days.	After 5 days.	After 6 days.	After 7 days.	After 8 days.	After 9 days.	
Sugar	25·26	23·94	21·73	18·24	12·86	7·86	5·05	2·94	1·41	·43	
Dextrose	(12·58)*	—	—	—	5·96	—	—	·69	—	—	
Levulose	(12·64)*	—	—	—	6·94	—	—	2·31	—	—	
Alcohol, vol. per cent....	nil	·72	2·03	4·04	7·22	10·28	11·96	13·20	14·13	14·78	
Alcohol, gms. per 100 c.c.	nil	·57	1·61	3·21	5·73	8·16	9·49	10·48	11·22	11·74	
Glycerine	(·0196)*	·165	·388	—	·872	1·026	—	—	1·146	—	*Mean.*
Alcohol, per 100 sugar fermented	—	42·8	47·0	45·9	46·8	47·1	46·9	48·4	53·0	50·3	47·3
Levulose fermented, per 100 dextrose ...	—	—	—	—	86·1	—	—	87·9	—	—	87·0
Glycerine formed, per 100 alcohol	—	25·5	21·4	—	11·8	6·3	—	—	4·0	—	10·4

* Taken from L_1.

M—*Fermentation at 30° C. with addition of Alcohol.*

NOTE.—The daily addition of alcohol was made *after* the sample had been taken for analysis.

	Original Must.	After 1 day.	After 2 days. 1% added alcohol.	After 3 days. 2% added alcohol.	After 4 days. 3% added alcohol.	After 5 days. 4% added alcohol.	After 6 days. 5%
Sugar	25·05	21·67	15·74	9·88	7.42	6·55	6·48
Dextrose	(12·49)*	—	7·64	—	—	2·87	stuck.
Levulose	(12·56)*	—	8·12	—	—	3·70	
Total Alcohol, vol. per cent. ...	nil	1·91	6·30	10·74	13·19	14·72	
Alcohol of fermentation, vol. per cent.	nil	1·91	5·30	8·74	10·19	10·72	
Alcohol of fermentation, gms. per 100 c.c.	nil	1·52	4·21	6·95	8·09	8·51	
Glycerine	·018	·400	·618	·809	·861	·879	
Alcohol formed, per 100 sugar fermented	—	45·0	45·4	46·9	46·3	47·1	*Mean.* 46·0
Levulose fermented, per 100 dextrose	—	—	91·6	—	—	92·7	92·1
Glycerine formed, per 100 alcohol formed	—	25·2	8·1	7·0	4·6	4·3	10·1

* Calculated from results obtained in K and L.

NOTE.—The following quantities of alcohol were obtained at each sampling from the trap attached to the fermentation flask:—

K_1	·25 c.c.	1·06 c.c.	1·12 c.c.	·56 c.c.	·32 c.c.	Total 3·31 c.c.			
K_2	·22 c.c.	1·11 c.c.	1·14 c.c.	·61 c.c.	—				
L_1	nil.	·19 c.c.	·30 c.c.	·54 c.c.	·56 c.c.	·24 c.c.	·18 c.c.	—	·11 c.c.
L_2	nil.	·13 c.c.	·31 c.c.	·57 c.c.	·24 c.c.	—	·11 c.c.		
M	·27 c.c.	1·38 c.c.	1·04 c.c.	·66 c.c.	·33 c.c.				

1. *The relation between sugar fermented and alcohol formed.*

I retabulate the ratios of the alcohol formed per 100 grammes of sugar fermented, as given in tables A to M.

										Mean.	Total Alcohol Formed, gms. per 100 c.c.
A	42·4	45·6	43·9	42·2	45·9	47·8	—	—	—	44·6	8·24
B	45·7	40·5	47·6	48·1	—	—	—	—	—	46·7	10·19
C	44·1	46·2	45·0	—	—	—	—	—	—	45·3	6·53
D	41·7	42·8	46·3	46·9	50·6	—	—	—	—	46·3	8·41
E	45·2	45·7	46·4	—	—	—	—	—	—	46·0	9·74
F	46·2	43·6	45·9	—	—	—	—	—	—	45·3	10·74
K_1	44·6	45·7	48·0	46·8	49·2	—	—	—	—	46·7	11·64
K_2	43·0	43·2	48·8	45·7	54·5	—	—	—	—	46·4	11·65
L_1	45·2	44·4	45·2	48·4	46·8	47·2	50·0	49·3	49·5	47·2	11·75
L_2	42·8	17·0	45·9	46·8	47·1	46·9	48.4	53·0	50·3	47·3	11·74
M	45·0	45·4	46·9	46·3	47·1	—	—	—	—	46·0	8·51

Despite considerable irregularity the following general conclusions can be drawn:—

While, according to the formula $C_6H_{12}O_6 = 2\ CO_2 + 2\ C_2H_{6}O$, 100 parts of sugar yield 51.1 parts of alcohol, and Pasteur's empirical formula states that 100 of sugar yield on an average 48.4 of alcohol, the amount of alcohol obtained above per 100 of sugar varies between the narrow limits of 44.6-46.7 for the practical fermentations, and between 46.0 and 47.3 in the laboratory fermentations, where loss of alcohol by volatilization was prevented. These figures compare well with those obtained by other observers. For example, Roos and Chabert in Algeria, Twight and Ash in California* have obtained the following results in practical fermentations†:—

At 25° C.	At 30° C.	At 35° C.	
45·8	45·1	41·5	Roos and Chabert.
46·0	44·8	43·0	Twight and Ash.
46·0	46·0	44·6	
43·6	44·0	40·5	

For K_1, K_2, L_1, L_2, M, it is obvious that the ratio is greater during the later stages of the fermentation, and this is true also for the fermentations A to F, though not to the same extent, probably, *inter alia*, because more alcohol is lost by volatilization at the later stages. We have, for example, at different stages of the fermentation—

	Alcohol per cent.	Alcohol to 100 sugar.	Alcohol per cent.	Alcohol to 100 sugar.
A	7·14	44·4	8·26	44·6
B	6·03	45·8	10·19	46·7
D	7·20	45·6	8·49	46·3
E	5·70	45·7	9·74	46·0
F	5·84	44·8	10·74	45·3

(C is omitted as total alcohol is only 6·53 per cent.)

From K_1, K_2, L_1, L_2 we see that the ratio is greater for the fermentations at the lower temperature. It is impossible to draw any similar conclusions for the musts A to B, for, owing to the variations in temperature, the evidence is insufficient.

2. *The relative rates of Fermentation of Dextrose and Levulose.*

With regard to the fermentation of dextrose and levulose, most sweet wines contain an excess of levulose over dextrose, indicating that the yeast makes a selective attack on the dextrose. To this, however, there are many exceptions, not only among alcohol-producing organisms generally, but even among the true wine yeasts, of which some races ferment levulose more readily than dextrose.‡ Among recent papers on the subject Gautier and Halphen§ state that in the fermentation of grape must dextrose is fermented first. Knecht|| has shown that, for invert sugar (i.e. an equimolecular mixture of dextrose and levulose) the dextrose ferments the quicker; for a solution containing 8 per cent. dextrose and 1 per cent. levulose, the rates of fermentation were as 10 to 1, but for a mixture of .8 per cent. dextrose and 8.2 per cent. levulose, the rates were as

* Bulletin 159, University of California publications.
† These are averages of two to four recorded results.
‡ Dubourg, Rev. de Vit, 1897, p. 468.
§ Journ. Pharm. Chim., 1903, 49-117.
|| Centr. Bakt. Pav., ii, 1906, 161, 215.

1 to 24. In solutions containing more nearly equal proportions of the two sugars, such great differences do not exist.

These and other investigations were made by observations on the rate of fermentation of the sugars over considerable periods of time, during which concentration of the nutrient substance, growth and activity of the yeast were variable, and the same variable conditions prevail in my experiments. Recently, however, Slalor,* by making determinations of the quantity of carbon dioxide produced in fermentation, has been able to work over small ranges of time during which the conditions were practically uniform. His conclusions are that, when acting on solutions containing only one species of sugar with various species of yeast, the speed of fermentation of dextrose and levulose are practically identical, e.g.—

Yeast.	Dextrose fermented.	Levulose fermented.
Saccharomyces cerevisial	100	93
„ exiguus	100	102
„ ellipsoileus	100	105
„ Carlsberg I.	100	105
„ apiculatus (Rees)	100	105
Kephir yeast	100	91

The author also shows that the relation still holds if the yeast is crippled by heat or chemical agents, and that between the limits of 2 and 12 per cent. the rate of fermentation is independent of the concentration. The quantities of levulose fermented per 100 of dextrose, given in the tables in the earlier part of this article, are, for convenience of reference, collated here:—

				Mean.
A	77·1	93·2		86·0
B	76·8	86·7		81·2
C	73·9	67·9		69·4
D	82·5	81·6	90·7	85·2
E	84·0			84·0
F	89·2	82·8		85·5
K_1	97·4	90·4		93·6
K_2	92·9			92·9
L_1	86·4	84·3		85·2
L_2	86·1	87·9		87·0
M	91·6	92·7		92·7

From a consideration of the fermentations A to F, we see that in three cases, A, B, D, the ratio is higher towards the latter half of the fermentation; in C and F, however, the reverse is the case. A similar irregularity is apparent in the laboratory fermentations K to M. With the exception of the fermentation of the White French must C, the figures lie between 81.2 as a minimum and 93.6 as a maximum, and the average for the Constantia fermentations is a little lower than that obtained from the imported levure. Whether this is due to differences in the milien, or lies in the nature of the yeast itself, it is impossible to say from these experiments.

The general conclusion, however, is quite certain that dextrose is fermented more quickly than levulose.

* Journal Chem. Society 1906, 128; 1908, 217.

From the fermentations K, L, and M, the two following deductions can be drawn for the particular yeast used, working at constant temperature in a must initially rich in sugar:—

(*a*) In fermentations at 30° C., the relative rate of fermentaiton of levulose to dextrose is greater than in fermentations at 25° C. (*cf.*, K, L).

(*b*) The inhibitory influence of alcohol on the yeast does not affect the relative rates of fermentation of the sugar (*cf.* K, M).

3. *The Formation of Glycerine in the Vinous Fermentation.*

The formation of glycerine during the alcoholic fermentation has been the subject of numerous researches, and the conclusions reached have been almost equally numerous. The problem has doubtless, in many cases, been complicated by the pre-existence of glycerine in grape must before regular fermentation has begun. The results obtained by Zeisel and Fanto and the observation of Laborde* that grapes often contain glycerine produced by the mould *Botrytis cinerea* (noble rot), show that it is always a necessary preliminary to test the must for the presence of glycerine.

A far more serious difficulty arises from the approximate methods of analysis, which were the only ones available up to the date of publication of Zeisel and Fanto's paper. Unfortunately the errors due to the imperfections of these analytical processes are greatest in saccharine liquids. That is to say, the absolute error is greatest in those liquids wherein the fermentation process is least complete, and which contain but small percentages of glycerine; the percentage errors in these cases are therefore enormous.

The problems which I propose to consider here are

(1) whether the initial or the final stages of fermentation are the more favourable to the production of glycerine?

(2) the influence of temperature on the production of glycerine;

(3) whether the presence of alcohol influences the formation of glycerine?

With regard to these and cognate subjects, the literature is conflicting. To quote a few of the many memoirs on the subject, Thylman and Hilgert† found that slow fermentation and low temperature resulted in the formation of little glycerine.

Effront‡ states that the maximum quantity of glycerine is formed when the power of the yeast is almost exhausted owing to the disappearance of fermentable sugar.

Kayser and Barba§ find that more glycerine is formed proportionately to alcohol at 25° C. than at 35° C.

Laborde‖ concludes that feeble activity and unfavourable environment result in the formation of a high proportion of glycerine, that the formation is greater in proportion to alcohol in the earlier stages of fermentation, and that the presence of alcohol tends to prevent the formation of glycerine.

* Rev. De Vit, 1897, p. 301; Compl. Rend., 1899, through Journal Chem. Society, 1899, ii, 784.
† Archiv. fur Hygiene, viii, through Zeit. An. Chemie, 1890, p. 623.
‡ Compt. Rend., 1894, through Journal Chem. Society, 1894, i, 563.
§ Rev. De Wit, 1897, p. 1899.
‖ Compt. Rend., 1899, through Journal Chem. Society, 1899, ii, 784.

Gautier and Halphen* state that glycerine increases proportionately to alcohol.

Seifert and Reisch† find that the formation of glycerine is at a maximum in the earlier stages of fermentation when the rate of fermentation and of propagation of the yeast is greatest, and that the presence of much alcohol hinders the formation of glycerine.

The ratios between glycerine and alcohol which were obtained in my experiments are as follows:—

	Ratio Glycerine 100 Alcohol.						Mean.	Total Alcohol per cent.
A	14·2	11·0	10·0	6·7	7·2	5·0	9·0	8·26
B	18·3	14·2	8·9	7·6			10·9	10·19
C	19·0	10·9	7·6				12·0	6·53
D	25·2	15·0	12·5	5·7	3·0		10·8	8·49
E	20·4	10·8	6·7				9·8	9·86
F	13·7	11·3	5·2				9·1	10·74
K_1	24·7	16·2	8·3	6·5	5·4		12·2	11·65
K_2	24·9	16·5	8·2	6·0	4·0		12·2	11·67
L_1	22·3	11·9	6·0	2·4			9·6	11·75
L	25·5	21·4	11·8	6·3	4·0		10·4	11·22
M_2	25·2	8·1	7·0	4·6	4·3		10·1	8·51

(*a*) It follows from the above figures that, in the earliest stage of fermentation, the quantity of glycerine produced as compared with alcohol is relatively great; that it falls very rapidly at first, until, towards the end of the fermentation, the relative quantity formed may be as little as one-tenth of the original production. The production is very high for the first 2 or 3 per cent. of alcohol formed up to 25 per cent., and falls at the end of the fermentation to a minimum of 2.4 per cent.

(*b*) From the fermentations K_1, K_2, L_1, L_2, we have, for the particular yeast used, that more glycerine is produced at the higher temperature. This temperature of 30° C. is probably near the optimum for this particular yeast.

No generalization with respect to the influence of temperature can be drawn from the fermentations A to F, owing, possibly to the fluctuating conditions which prevailed, although it may be noted that the slowest fermentation A, which was also the coolest, yielded the lowest percentage of glycerine to alcohol.

(*c*) The influence of alcohol. It has been shown that more glycerine relative to alcohol is formed in the earlier stages of fermentation, i.e. that as the percentage of alcohol increases the rate of formation of glycerine decreases. That alcohol actually inhibits the formation of glycerine is apparent on comparison of the fermentations K_1, K_2, and M. In these the conditions were identical except for the

* Compt. Rend. through Journal Chem. Society, 1903, ii, 564.

† Cent. fur Bakt. Par., 1904, through J. S. C. I., 1904, 1107.

periodic addition of alcohol to M. From the tables above the following figures have been calculated:—

	Alcohol Formed.	Glycerine. 100 Alcohol.	Alcohol Formed.	Glycerine. 100 Alcohol.	Alcohol Formed.	Glycerine. 100 Alcohol.
K_1	1·51	24·7	4·79	19·0	8·81	14·2
K_2	1·66	21·9	4·78	19·7	8·83	14·3
M	1.52	25·2	4·21	14·2	8·51	10·1
Alcohol added to M ...	Nil	—	8 %	...	3·18 %	..

A consideration of the figures for L_1, L_2 shows that here also, despite the decrease in glycerine production due to diminished temperature, the quantity is slightly greater than in the case of M. We have—

	Alcohol. Per cent.	Glycerine. 100 Alcohol.
L_2	8·16	13·0
M	8·09	10·4

It does not, however, follow that the only, or even the principal, cause lessening the rate of production of glycerine during fermentation is the presence of alcohol. It is evident that glycerine production is not directly connected with the production of alcohol, i.e. with the destruction of sugar, but is a result of other processes in the yeast. Possibly it is connected with the propagation of new cells. Certainly there is no evidence in the experiments described above that glycerine is to any important extent a pathological product of fermentation.

SUMMARY.

For the practical fermentations the quantity of alcohol formed per 100 of sugar fermented lies between 44.6 and 46.7, with an average of 45.7; the quantity is somewhat less in the earlier stages, somewhat greater in the later stages of the fermentation.

The figures average one unit higher in the case of the laboratory fermentations. The average rates of fermentation of dextrose and levulose are as 100 to 82 for the practical fermentations, and as 100 to 93 for the laboratory fermentations. In the latter the difference in the rate is somewhat less at 30° C. than at 25° C.

The presence of alcohol does not affect the relative rates of fermentation of the two sugars.

Relative to alcohol, much glycerine is produced in the early stage of fermentation; very little towards the end. The maximum quantity per 100 of alcohol was 25.5, the minimum 2.4.

In the laboratory fermentations more glycerine was produced at 30° C. than at 25° C.

The presence of alcohol lessens the production of glycerine.

The formation of glycerine, therefore, is not directly connected with the splitting of the sugar and formation of alcohol, nor is glycerine a pathological product of the yeast. Possibly it is connected with the propagation of new cells.

Farm Animals in Health and Sickness.

WITH SOME NOTES ON THE CONTROL OF ANIMALS.

By J. J. EDGAR, Government Veterinary Surgeon, Zoutpansberg.

BEFORE proceeding to discuss the main theme of this article, namely, the care of farm animals in health and sickness, a few remarks on the mechanical control of animals may not be out of place. Stock inspectors and farmers should be thoroughly acquainted with the various methods of control. Medicinally, all animals can practically be controlled by sedatives, such as opium and anaesthetics, preferably chloroform, but what I wish more particularly to refer to on this occasion is the question of mechanical control. An interesting article on this subject appeared in the first issue of the *Agricultural Journal* from the pen of Mr. J. M. Christie, Assistant Principal Veterinary Surgeon (Transvaal), and the same gentleman contributed a similar article to the April, 1910, number of the *Transvaal Agricultural Journal*, both of which articles will well repay perusal. I have no wish to encroach on these articles, but rather to demonstrate simple and practical methods for daily use.

These methods are numerous, and the choice of a method depends upon the species of animal to be examined or of the nature of the operation to be performed. All animals should be approached carefully and cautiously, but with confidence. Render as little pain as possible, and do not forget to act humanely in dealing with the dumb animal.

The horse is controlled by means of a halter, cavasen, bridle, twitch, gag, stocks, hobbles, crushes, and casting ropes. As every one knows, a horse rises on his forelegs first, the opposite way to the ox, consequently his head should always be held down when cast. The ox is controlled by halter, reims round horns, bull-holders, rings, stocks, crushes, and casting ropes. The dog is controlled by collar and chain and a muzzle; the ostrich by cap and reims. The accompanying illustrations show various methods of casting the horse and the ox.

It is very necessary that stock-owners and others who come into contact from time to time with sick animals should be thoroughly cognizant with animals in health, so that a few remarks in this direction form a necessary preface to any article on diseases.

An animal in good health appears strong and vigorous. The eye is bright and lively, slightly moist, and not shrunken. The mouth should be moist to the touch, and have a sweet odour. The ears should assume a natural position, and if moved should be brisk, not sluggish, nor should they be drooped. The skin should have a sleek appearance, easily raised from the body, and not hide-bound. The hair should be glossy; in sheep the fleece should be oily. The gait should be lively, with no irregularity. The appetite in all animals should be good. The visible mucous membranes should be reddish-pink and

moist. The pulse, respirations, and natural functions should be normal. The temperature of the body should be equal. The abdomen should have a full appearance, i.e. the sides of the animal should not be collapsed or hollowed.

In health, a horse or mule will roll if opportunity is given him: the ox on rising stretches itself, and its muzzle is bedewed with moisture.

Disease in a general way is indicated by the following symptoms: Restlessness, sluggishness, irregularity of gait, anxious countenance, animal depressed and dull, refuses to feed, and, often, to drink. The mouth may have a foul odour. The eye loses its brightness and often looks sunken. The ears are drooped and slow in movement. The skin loses its silkiness or gloss, becomes dry and hide-bound (due to absorption or non-deposition of fat, which is always a sign of extreme unthriftiness). Sick animals have usually a tucked-up appearance, and cease to lick themselves. Normal functions are suspended in the ox, rumination ceases, and in the cow rumination and lactation ceases.

Disease is often ushered in by shivering or sweating, as the case may be; shivering more particularly is seen in the horse, and indicates fever. The horse also sweats in painful complaints, such as bowel affections (e.g. colic). The ox sweats to a less extent by its muzzle. The dog and the cat sweat in the soles of their feet, proved by varnishing a dog, when he will not die.

The skin.—Particular attention should be directed to the condition of the skin.

Salivation is profuse in foot-and-mouth disease, tetanus, brain disease, rabies, sore throat, and injuries to the gums and teeth.

Grinding of teeth is excessive in brain affections and stomach troubles.

The mouth.—The odour of the mouth and colour of the mucous membranes should be noted for disease of the teeth and jaundice. In rinderpest, distemper, and tetanus the odour is foul. In billiary fever the membranes are a dirty pale yellow, in anaemia they are pale.

The tongue should be examined for blue-tongue in the sheep and the horse, and for measles in the pig.

The nose of the dog and cat when hot and dry indicates disease, and a discharge is seen in ordinary colds, in distemper in the dog, and strangles and glanders in the horse.

The nostrils.—Dilated, twitching nostrils are indicative of lung trouble, pneumonia, and horse-sickness.

The eyes should always be carefully examined for discharges. The normal eye secretion is composed of mucus and water in small quantities; in disease it is thick and dirty. In cases of biliary fever the eye assumes a pale or yellow condition; it often has a sunken appearance, such as we see in cases of East Coast fever. Swellings over the eyes do not always indicate that a horse is suffering from horse-sickness; it is also seen in cases of biliary fever in equines.

The throat should be examined in cases of difficulty in swallowing or breathing, or when a whistling sound is emitted, or for abscesses (as in strangles). Dropsical swellings of the throat, especially in sheep, often indicate that the animal is suffering from a

parasitical infection, as seen in sheep affected with wire-worm or fluke in the liver.

Breathing and coughing.—The respirations are increased in most diseases; coughing may be heard and may indicate disease of the lung. There are various kinds of cough (in man from a consumptive or graveyard cough to a wheezy cough), from the cough of a common cold in the horse to the cough of lung-sickness in cattle. In suspicious cases of lung-sickness in cattle and horse-sickness the respiratory movements of the lungs should always be listened to for the sounds of the natural inspiration and expulsion of air. This can be done by placing the ear to the side of the animal's chest or to the front of it just where the windpipe enters it.

Distention of abdomen or flatulence.—In the horse and ox this is indicative of indigestion and fermentation caused by a change of food or over-gorging on green lucerne, mealies, etc.

Constipation, or dry faeces, is indicative of some interference with the natural functions of the alimentary tract, and is seen in the early stages of most fevers, gall-sickness, etc.

Diarrhœa is indicative of digestive disturbances, and is usually due to a sudden change of food or the onset of some fever.

The urine should always be examined for blood, as it contains blood in redwater in cattle and often in biliary fever of the horse and dog.

The navel.—In young animals, especially calves, the navel should never be overlooked, but should be examined for signs of disease.

Death.—The signs of approaching death in an animal are anxious expression, profuse cold perspirations, coldness of the ears and extremities, with failing pulse and sub-normal temperature.

METHODS ADOPTED FOR DIAGNOSING DISEASE.—After careful examination of the animal for general symptoms, the scientific methods adopted for diagnosing disease is the beat of the pulse, rapidity of respiration, temperature, and examination of the various constituents of the blood, by means of blood and lymphatic gland smears. The natural discharges, namely, faeces and urine, must also be noted.

The pulse.—The pulse varies in different animals; the following may be taken as normal:—

Horse	36- 40	beats per minute.
Ox	45- 50	,, ,, ,,
Sheep	70- 80	,, ,, ,,
Pig	70- 80	,, ,, ,,
Dog	90-100	,, ,, ,,

The pulse is quicker in young animals than in old

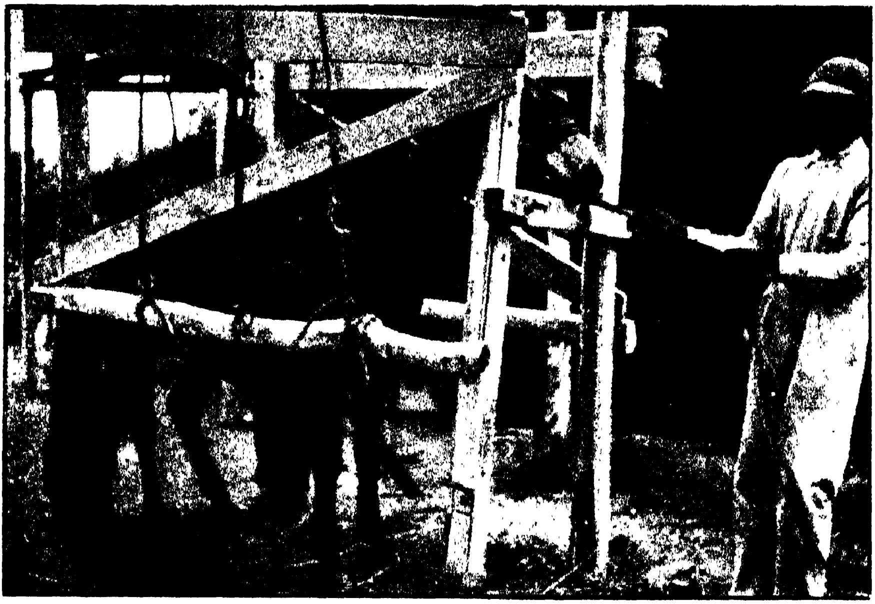
Respiration (i.e. the inspiration and expulsion of air).—This can be noticed by carefully watching the movements of the abdominal muscles. The normal respirations are as follows:—

Horse	8-10	per minute.
Ox	12-15	,, ,,
Sheep	12-20	,, ,,

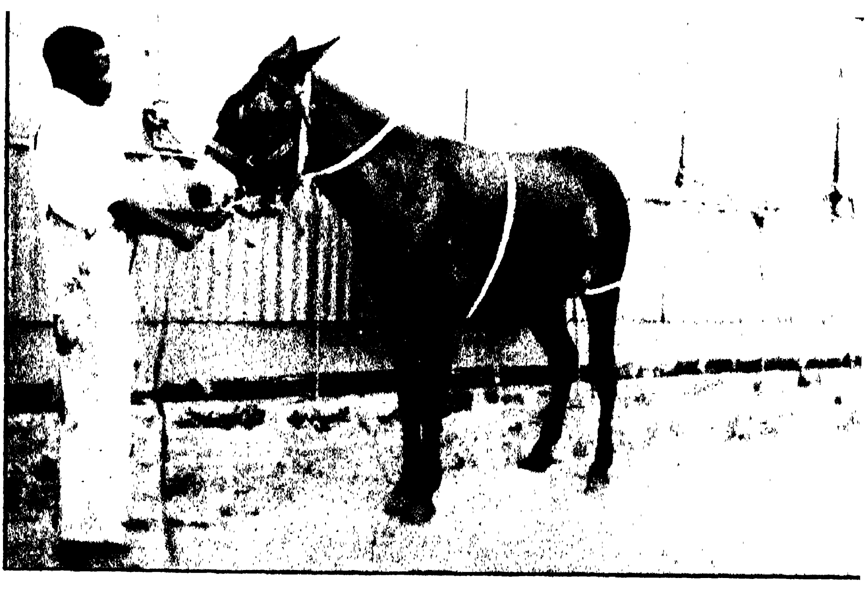
Temperature.—The temperature is taken by means of an instrument called the clinical thermometer, which is simply a graduated glass tube in which a vacuum has been formed and liquid mercury

Application of American gag.

Application of twitch with one foreleg secured.



A mule controlled by means of wooden stocks and supported by a web or leather belt.



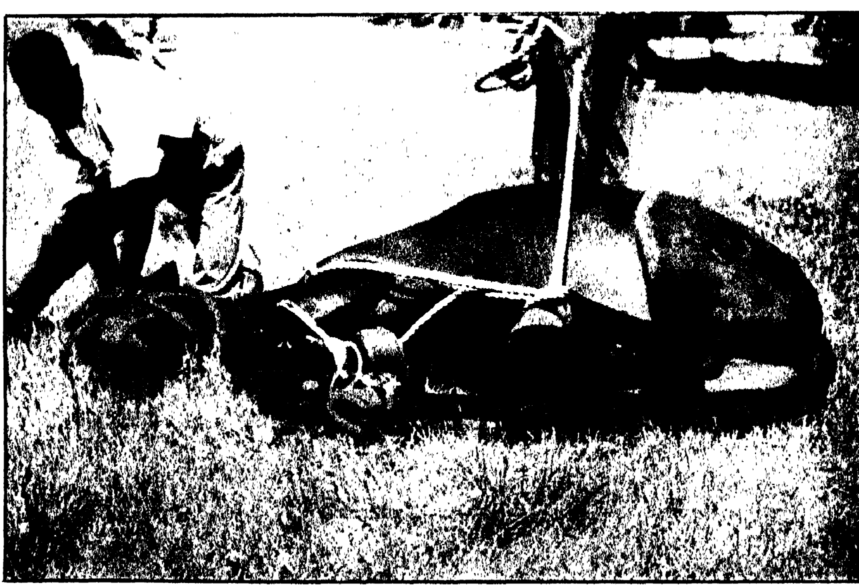
Animal hitched to a wall by means of a rope and three rings (used in lieu of stocks).

Securing of fractious mule preparatory to shoeing or handling him.

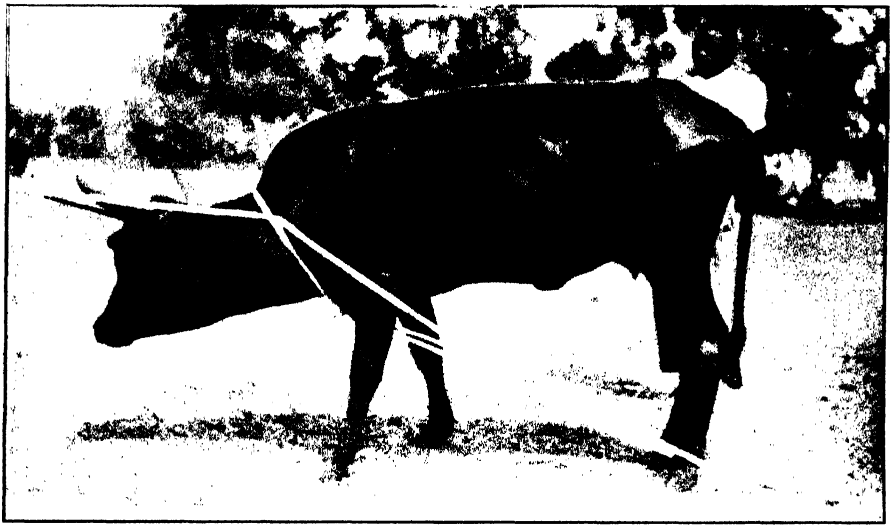
Method of control against kicking.

USUAL METHOD ADOPTED IN CASTING HORSE OR MULE

The rope is first doubled and a loop or collar made. The loop is passed over the head; the ends of the rope are carried inside the forelegs and around the hind fetlocks and forward through the collar; one end of the rope is pulled in a forward direction, the other end backwards.

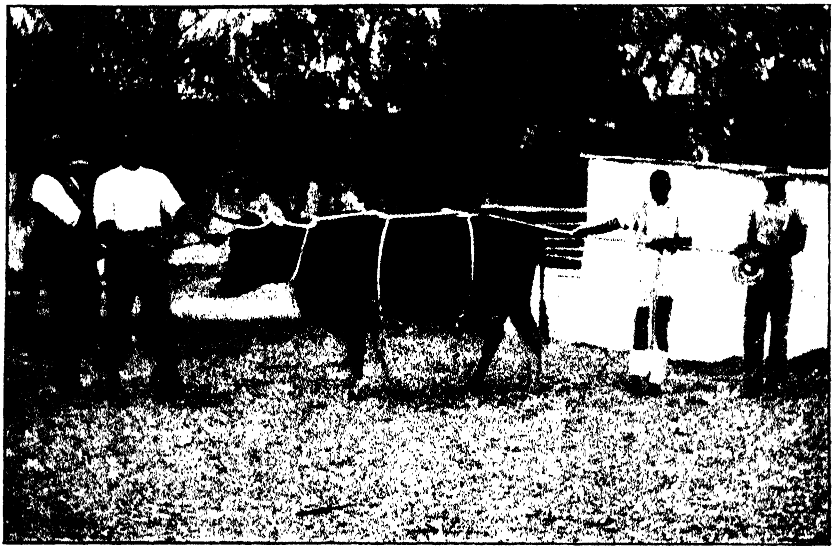


Animal cast and tied, by pulling hind legs well up to the body. Note the small lines hitching forelegs up, to control them.



Method of casting horse and mule applied to cow.

The cow cast and tied.



Rueff's method of throwing the cow.

Cow cast by above method.

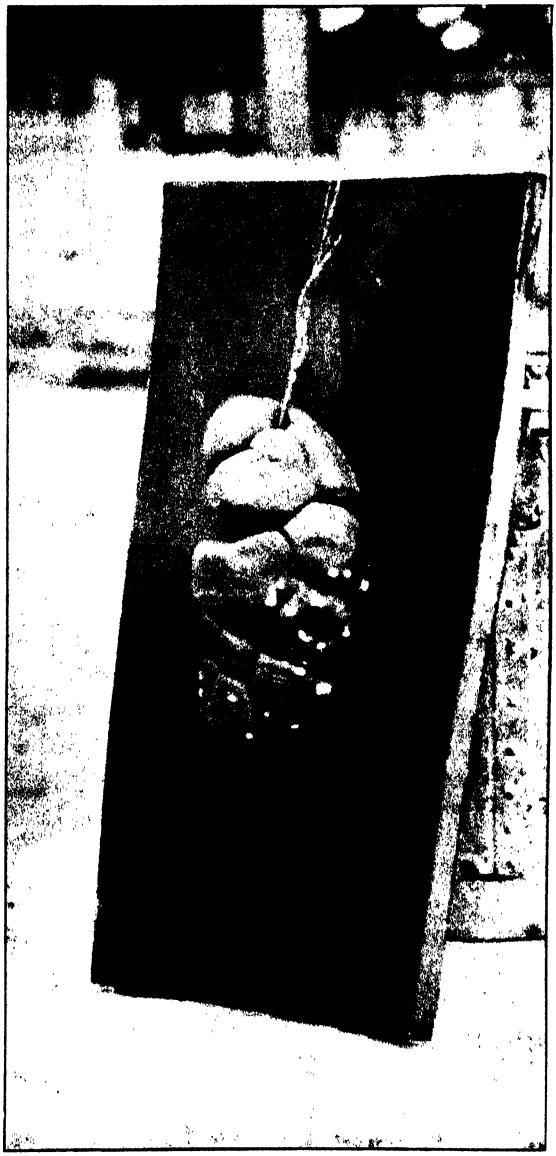
A Useful and Practical Method: —The rope is first doubled: the ends of the rope are passed under the animal and taken over the back and through the original loop. One end should be passed around the forelegs and the rope caught on itself; the same applies to the hind legs.

Animal secured by above method.

Showing position (x) where horse should be tapped or pierced with a trocar and canula for the relief of tympany or flatulence.

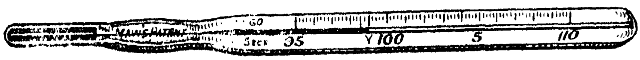
Showing position (x) where cow or ox should be similarly tapped.

EAST COAST FEVER.



Ox kidney, showing the diagnostic white spots, or "infarcts", in a part of its substance.

inserted, heat causing the mercury to expand. By the thermometer the degrees of fever are registered; it varies in the domesticated



animals, and is usually taken per rectum. The normal temperature is as follows (man, 98.4):—

Horse	100-101°	Fahrenheit.
Cattle	101-102°	,,
Sheep	103°	,,
Dog	100-101°	,,
Fowl	107°	,,

It should be noted that the temperature is slightly lower in the morning than in the evening, and there are also varying influences, such as age, sex, feeding and drinking, exercise, and external temperature, but these are not of much importance. The practical experienced man always knows how to allow for them.

NOTE.—Never clean a thermometer in hot water, as it will burst.

Blood smears.—The diagnosis of several diseases of stock in South Africa is easily made by means of an examination of the blood with the microscope, and smears should always be taken from the living or dead animal when any blood disease is suspected. The Department of Agriculture has issued a leaflet (No. 4) giving directions for preparing blood smears, which should be in the hands of all stock-owners. In Transvaal, glass slides and envelopes for forwarding them can be obtained from postmasters and all police posts.

It has recently been discovered that a better and more reliable diagnosis of East Coast fever can be made by examining the smears taken from a lymphatic gland; when stained they show peculiar blue bodies well known to our pathologists as *Koch's granules*. Lymph is merely blood minus the red blood corpuscles. The lymphatic glands are small, ovoid bodies interposed along the course of the lymphatic vessels, and through which the lymph passes. The lymphatic glands act as filters, and, for a time at least, arrest and prevent disease-producing organisms entering the general circulation, as note, for example, what happens in the case of septic wounds, and in diseases such as anthrax, where the glands near the wound swell up. In diseases, especially of the blood, it is most important, either before or after death, to examine the condition of the lymphatic glands, as they often become swollen, soft, and congested, and watery in appearance.

When smears have been made let them dry thoroughly, and then wrap each glass in a small piece of thin paper; on no account should glass smears ever be stuck together or have pieces of paper adhering to them.

REMARKS ON A FEW STOCK DISEASES.

As rinderpest and lung-sickness are diseases well known to most stock inspectors and farmers in this country, I will confine my remarks to the following, viz.:—East Coast Fever, Redwater, Gall-sickness, Anthrax, and Blackwater.

EAST COAST FEVER.

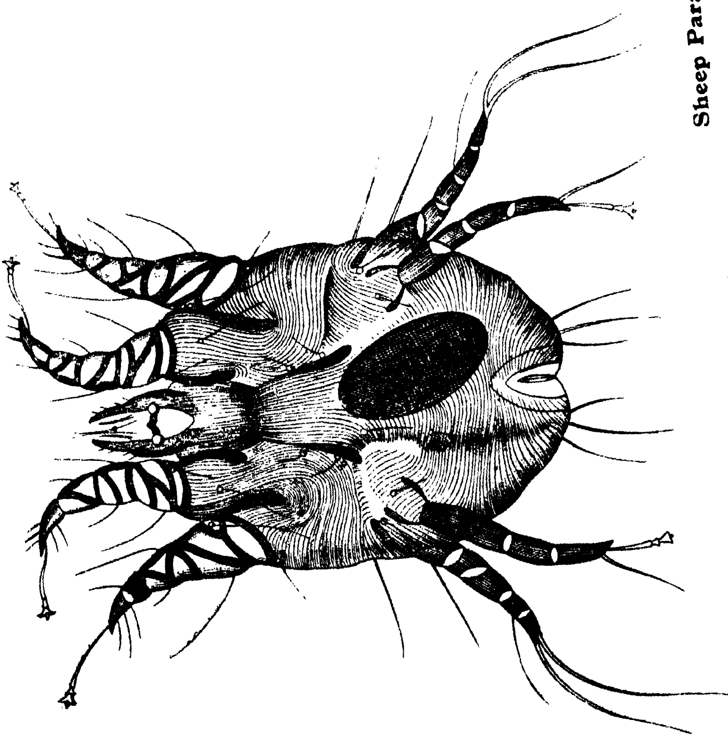
East Coast Fever is also known under the names of Rhodesian Redwater, "Tick Fever", "the Pest", etc., but the accepted term is East Coast Fever. It may be defined as a specific blood disease affecting cattle only, and caused by a special parasite which invades the red cells of the blood. The disease is not in the true sense of the word contagious, but is conveyed by the medium of ticks that have become infected by sucking the blood of a beast suffering from the disease.

East Coast Fever first came to notice in German East Africa, and was there described by the late Professor Koch, who was investigating the disease. It broke out subsequently in Rhodesia (in or about 1901), and invaded the Transvaal in 1902. Zoutpansberg became infected in 1903, and as at that time no restrictions were placed on the movement of cattle, it naturally spread throughout the district with great rapidity, and has been responsible for the deaths of thousands of cattle since that date. The district is still infected, but to a lesser extent, as can be seen by the returns of the Agricultural Department.

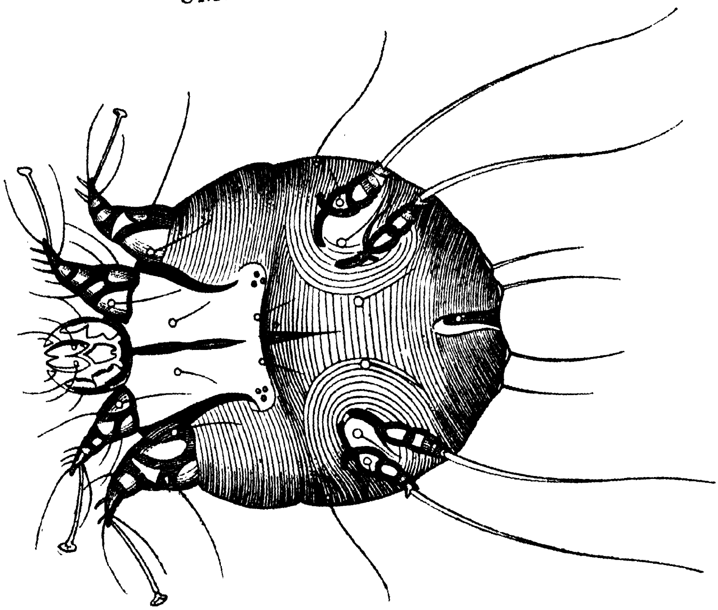
The special blood parasite which is the cause of the disease has been named by Dr. Theiler as *Piroplasma parvum*, and is known in zoological literature as *Piroplasma parvum theileri*.

The incubative period of the disease, when transmitted by ticks, varies from ten to twenty days, but the average is thirteen days. The disease is only naturally transmitted by means of a tick. An experiment was carried out by the Department of Agriculture, in the Zoutpansberg District, at the request of several farmers, in 1908, to prove the efficacy of a preventive inoculation that the late Commandant van Rensburg, Blood River, Zoutpansberg, said he had discovered. Two suitable animals were obtained and inoculated by Commandant van Rensburg, and placed under his charge until the experiment was finished. After the inoculation was completed and the inoculator satisfied, I placed infected ticks, sent to me by Dr. Theiler, on the animals (six on one and five on the other). The temperatures were recorded daily, and on the 12th day after the placing of the ticks it was noted that the temperatures of both animals had risen above normal. The rise of temperature continued throughout the successive days; both animals appeared sick and continued so until the 21st day—i.e. from the time the infected ticks were placed on them—when the temperatures suddenly dropped and both animals died. This local experiment proved that ticks convey the disease and that the inoculation gave no protection. Smears were taken from both the animals mentioned and sent to Dr. Theiler's department for examination, the department informing us that the smears in both cases showed East Coast fever parasites. The post-mortems made were also typical of the disease. The ticks responsible (and proved to be so by Mr. Lounsbury and Dr. Theiler) for conveying the disease are the red tick, the brown tick, the shining brown tick, the Cape tick, and the black-pitted tick. Ticks in all stages of their life, however, do not always convey the infection; especially is this the case when the tick is in the larval stage. They only do so when in the nymphal stage after having sucked on a sick beast as larvae and in the adult stage after having sucked on a sick beast as nymphae. It thus differs in its mode of infection from ordinary redwater in that the poison of the disease does not pass through the egg of the tick. The majority

Sheep Paras ies



(1) *Psoroptes communis.*



(2) *Sarcoptes scabiei.*

of ticks undergo during their life various stages of development and moulting, but as this subject is too extensive to be dealt with here, it will suffice to state that the development from larvae to nymphae and nymphae to adult, on and off the animal, requires a period of about six weeks; this process of stage development and moulting of the tick accounts for the length of time that sometimes elapses between the first outbreak of the disease and subsequent outbreaks. The life of the tick, according to the species, varies from seven to fourteen months, and this has to be noted in dealing with the disease. The blood is not infective and thus does not produce the disease when injected from a sick animal into a healthy animal, nor do recovered animals act as reservoirs of the virus as in redwater or gall-sickness, and recovered or "salted" East Coast fever animals are still susceptible to the diseases redwater and gall-sickness.

Diagnosis.—A correct and confirmatory diagnosis of this disease can only be made by examination of the blood by means of the microscope, and smears should for this purpose be taken from the spleen and lymphatic glands. Peculiar blue bodies (Koch's granules) are seen in the smears which are diagnostic of the disease.

When East Coast fever is suspected in any area smears should always be taken and forwarded for examination from the sick beast, in the early, or preferably in the latter stages of the disease, as in the latter stages the parasites are more numerous in the blood and may be more readily seen. In such a case it would be well to forward both blood and lymph gland smears daily for examination.

Symptoms.—The general health is impaired, there is high fever, drooping of the ears, sunken and running eyes, and dripping of saliva from the mouth; the lymphatic glands externally appear swollen, there may be diarrhœa or constipation, the urine is normal in colour, the animal as the disease advances becomes dejected and weak, with hollow sides, and at this stage may attempt to become aggressive. The animal eventually gets weaker, lies down and dies. The average time from infection to death, which includes the incubation period (about thirteen days) and the period of sickness (twelve days), is about twenty-five days in all.

Post-mortems.—The lungs may be found in a state of congestion, with froth in the wind-pipe; in such a condition one often notices a discharge from the nostrils similar to that seen in horse-sickness, red spots may be noticed on the walls of the heart, the liver is usually enlarged and varies in colour, the bile is generally thick, yellow or green, the spleen is not enlarged to any appreciable extent, the kidneys may appear pale or congested and red, white spots are present both on the surface and in the substance. These are known as infarcts and vary in size. The fourth stomach and intestines often show acute inflammation, the lymphatic glands are swollen and congested.

Eradication.—In eradicating East Coast fever various methods are resorted to, such as dipping and the moving of non-infected cattle on to clean ground.

From experience we find that dipping does not stop the disease in an infected herd; it ought, however, to be carried out rather as a preventive to lessen the risk of infection and reduce the number of ticks. Grass burning also assists in the destruction of ticks. Too much reliance, however, must not be placed on the methods mentioned if adopted with the view of stopping the disease, as it is not without serious risks of subsequent outbreaks, and should not be encouraged. The general policy in the Zoutpansberg District has been the

slaughtering off of all cattle on an infected farm or area, and the immediate fencing of such farm or area; and, reasoning from the life-history that a tick's existence is under fourteen months, a period of fifteen months is allowed to elapse before such area or farm may be restocked. This policy, in my opinion, is the safer and most economical method. In this district several farms cleared of cattle by slaughter which were once badly infected have been restocked at the end of fifteen months with safety.

I have previously mentioned that the tick is the natural method of transmitting the disease from the sick to the healthy animal, and that the blood inoculated from the sick to the healthy animal will not convey the disease, but recently it has been demonstrated in the Government Veterinary Laboratory at Onderstepoort that artificially it can be transmitted by inoculation of portions of the spleen from an infected beast into the abdominal cavity of a healthy animal. This discovery may yet be the medium of obtaining an inoculation as a protective.

In an East Coast fever infected district every farm ought to maintain its own cattle, and fencing should be encouraged for this purpose. A common watering hole to several farms is always a source of danger in the spread of this disease.

REDWATER.

Redwater is scientifically termed "Haemoglobinuria", and it is also popularly known as ordinary redwater, stop-ziekte, tick fever in Australia, and in North America as Texas fever. Smith and Kilborne, of America, were the first writers to give a description of the disease and publish a treatise of their investigations. Koch later described it in South Africa (1898-1904). The disease is peculiar to cattle. It may be described as a disease accompanied by fever and clinically distinguished by the passage of blood-stained urine; the colour of the urine varying from a lightish red to a brownish red or even black coffee colour. It is caused by a parasite that invades the red blood corpuscles and is called the *Piroplasma bigeminum;* this blood parasite being conveyed from the sick to the healthy animal by the medium of the bite of the tick. The tick that is responsible for the disease in South Africa is the common blue tick, in either its adult or larval stages. This has been proved by an experiment carried out by Dr. Theiler. The following is the result of the experiment in his own words:—

> "Our South African redwater is transmitted by the *Rhipicephalus decoloratus*, i.e. the common blue tick. This fact has been clearly demonstrated by Professor McFadyean, of London, and myself. I reared blue ticks on a calf and inoculated the calf with redwater blood, so that the full-grown blue females dropped during the reaction of redwater, and when the blood contained the *Piroplasma bigeminum* the females were collected in glass dishes where they laid the eggs. The eggs were placed in a glass bottle and sent to Professor McFadyean in London, where they arrived safely. Shortly after their arrival the eggs hatched, and the Professor placed the young larvae on a calf and a steer, and both animals contracted redwater. The Professor was good enough to send me blood smears of the sick animals in which I found the *Piroplasma bigeminum* of our common redwater."

From the foregoing it is evident that the disease passes through the egg of the tick.

Symptoms.—The symptoms generally noticed are serious disturbance to the general health; appetite is suspended; rumination ceases; the animal is dull and stands with ears dropped, its back arched, and appears weak in the loins, and shows a disinclination to move. Twitching and quivering of the muscles of the flank and shoulder are sometimes noticed and are a grave symptom; the animal is constipated, but the faeces at the onset may be soft, but eventually as the disease progresses they become dry and hard. A characteristic symptom, however, in old animals is the colour of the urine, but in younger animals this may not be noticeable, as the urine may not be discoloured to any appreciable degree.

Post-mortem.—On post-mortem examination the carcass is pale and bloodless as if the animal had been bled; the inner lining of the heart walls show petechiae or red spots, the liver is enlarged, and the gall bladder is distended and contains a dark green bile. The kidneys are congested and often dark in colour; the spleen is enlarged to two or three times its normal size. The contents of the third stomach are dry and hard and the mucous membrane of the intestines is swollen and congested. The bladder may contain red urine.

Diagnosis.—Smears should always be taken for the purpose of microscopical examination, preferably from the kidney and heart muscle.

Severity of the disease.—The severity of the disease depends on the age of the susceptible animals. Young animals do not become so badly infected as the older ones, and the younger the calf the greater the likelihood of its acquiring an immunity when reared on redwater infected veld. Recovered animals harbour the parasite in their blood for a long time, so that redwater may be produced by the inoculation of a susceptible animal with blood from a recovered animal apparently in perfect health, but which was born and bred in a redwater area. This has been taken advantage of as a preventive, and imported animals have been subjected to an inoculation conveying a mild form of the disease. This inoculation has been practised with varied success.

GALL-SICKNESS.

Anaplasmosis of cattle may be described as a blood disease characterized by an extreme jaundiced condition of the tissues consequent on an over-production of bile. It is often associated with the previously-described disease redwater, and the two diseases may appear simultaneously in the same animal, or gall-sickness may, and often does, appear as a sequel of redwater, and then it appears independently. It has lately been discovered that it does exist independently and not complicated with any other disease, and that it is due to a piroplasm known to pathologists as *Piroplasma marginalae.* Dr. Theiler has applied the scientific term Anaplasmosis of Cattle to this disease, and the species of the piroplasm responsible for the disease he has called *Anaplasma marginalae.* It has also been proved that the common blue tick is principally responsible for conveying the disease from the reservoir (such as recovered animals) to the susceptible animal. The symptoms may be confounded in the earlier stages of the disease with redwater (before red urine is voided), and then a correct diagnosis can only be made by the aid of the microscope. The incubative period of gall-sickness is longer than that of redwater, and

varies from twenty-three to thirty-two days (redwater incubative period seventeen to eighteen days). The symptoms are those of high fever and a general disturbance of health; the animal loses condition rapidly, the muzzle and mucous membranes become pale, and the conjunctiva of the eye bloodless. As the disease advances the symptoms appear more pronounced and the parts mentioned turn distinctly yellow; the animal becomes constipated and the faeces, when voided, are dry and yellow with a covering of mucus. The urine is often noticed to have a yellow colour, but never red. Sometimes nervous symptoms are noticed, but in these cases blindness often occurs.

Post-mortem.—On first opening the carcass of a typical case, especially as seen in an imported animal, one is struck by the markedly pale yellow condition of the flesh; the blood is thin and watery; the liver assumes huge proportions and is distinctly yellow and soft, and, when cut, the section shows a yellow tinge; the gall-bladder is much distended and contains a dark green bile, which, from the over-production, becomes reabsorbed into the system and accounts for the yellow discolouration of the tissues; the spleen is enlarged and the third stomach (as in redwater) contains dry food, the intestines show bile staining and the kidneys look pale and yellow. This disease, as is the case with redwater, is seen wherever blue ticks are numerous, especially in the low veld, and more particularly when imported animals are introduced therein. As in redwater, an animal that has recovered from an attack of this disease remains as a reservoir of the parasite and a source of infection for years. This disease, like redwater again, passes through the egg of the tick; the larvae can thus convey the disease.

In dealing with this disease one would have to take steps either (*a*) to reduce the number of the ticks, or (*b*) by exposing animals when only very young to a natural infection, to endeavour to produce a natural immunity.

ANTHRAX.

Anthrax is also known as splenic fever, charbon, or milt-ziekte. It is due to the entrance into the system of a bacillus or rod-shaped microbe organism called *Bacillus anthracis*. In most cases the first sign of an outbreak is the discovery of a dead animal—probably the animal was left a few hours previously in apparent health. The symptoms are seldom noticed and are not characteristic. The temperature, which rises to 107° or 108° F., would be a guide if accompanied by a little oozing of blood from the nose or anus. After death, putrefaction sets in very rapidly, the abdomen becomes tympanitic, and the vagina and anus are everted and bloodstained. Any method of destroying or disposing of the carcass which involves skinning or cutting should be avoided, as the disease is likely to spread thereby; in addition, people engaged in such work run a very serious risk of being inoculated with the disease. Should the carcass, however, be examined and opened one would expect to find bloody discharges from the anus and mouth, superficial vessels engorged with black, tarry uncoagulated blood, spleen much enlarged and containing liquid tarry blood, often likened to raspberry or damson jam. Haemorrhagic conjestion is noted throughout the intestines, and they have a black appearance; the lymphatic glands are soft and swollen. Other organs show nothing abnormal. The bloody discharges from the anus and

mouth are very virulent, and should be disinfected. As already mentioned, however, a carcass should not be opened, as the process tends to spread the disease by allowing air (oxygen) to it, which favours the sporulation of the bacillus in the blood.

Man is usually infected through a wound, as in "wool-sorter's disease". In the burial or destruction of carcasses great care ought to be exercised not to contaminate food or water. The orifices of the carcass ought to be plugged and the carcass burnt or buried in quicklime 6 ft. deep and the area fenced off.

The pig and horse when affected with anthrax show prominent swellings in the throat.

QUARTER-EVIL.

Quarter-evil is also known as black-quarter, quarter-ill, and sponsziekte. This is not a scheduled disease, but I merely bring it to your notice as it has been occasionally seen in this district, particularly in the Blauwberg area. It is a disease that affects the ox and sheep—principally the ox, attacking him at the age of from 6 to 18 months; it is seldom seen in older oxen. It is caused by the bacillus of black-quarter gaining access to the system through the medium of a wound; it is characterized by stiffness, lameness, and peculiar crepitating swellings or tumours. The percentage of recoveries is small. On post-mortem examination the abdomen is seen to be distended, putrefaction soon sets in, the blood coagulates and is normal in colour.

In the shoulder, chest, or hip an emphysematous swelling may be found; this swelling or tumour is due to a distension of subcutaneous tissue by gases, and these gases are formed by the microbe. If the swelling is cut into both gas and bloody exudate escape. The liver is engorged, but the spleen is normal in size; affected muscles are black. The blood contains no bacilli as a rule, the habitat of the bacilli being the subcutaneous tissue, so that smears for examination should be made from the exudate. This disease also is fatal, and preventive measures should be taken to top-dress infected ground with lime and salt.

Human beings, pigs, and dogs are said to be immune.

MAKING OF POST-MORTEMS IN GENERAL.

In making a post-mortem examination it is well to recognize that some system should be adopted, or otherwise it is just possible that some important organ and lesion may be missed. One must continually keep in mind when making a post-mortem examination that we have various apparatus and systems making up the body, such as the digestive, respiratory, urinary, and generative organs of the male and female. These should be examined in rotation as follows:—

(1) *Digestive Apparatus*, which consists of the mouth, pharynx, oesophagus, diaphragm, spleen, stomach, duodenum, liver, great colon, caecum, intestines, floating colon, rectum, and anus.

(2) *Respiratory Apparatus*, consisting of nostrils, nasal chambers, larynx, trachea, bronchi, thorax, pleurae, and lungs.

(3) *Circulatory System*, consisting of heart, arteries, and veins.

(4) *Urinary System*, consisting of the kidneys, ureters, bladder, and urethra.

(5) *Generative Organs of the Male*, consisting of the spermatic cord, testicle, vas deferens, prostrate gland, Cowper's gland, urethra, penis, and seminal fluid.
(6) *Organs of the Female*, which consist of ovaries, fallopian tubes, uterus, vagina, mammary glands.

As a guide I will name a few of the diseases to be looked for pertaining to the individual organs when making a post-mortem examination.

Condition of Carcass.—The condition of the carcass should always be noted, whether it is lean or fat; also the condition of the skin—especially for evidence of lightning stroke in cases of sudden death.

Discharge.—A discharge should always be looked for from the natural orifices of the body, and its condition noted.

Flesh.—The flesh, colour, and condition must be noted, that is whether they are pale or jaundiced.

Glands.—The lymphatic glands, especially in blood diseases, should be examined as to whether they are soft and swollen.

Mouth.—Foreign bodies to be looked for.

Pharynx may contain an abscess or be inflamed as in pharyngitis (sore throat).

Oesophagus.—The oesophagus, or gullet, conveys food from the pharynx to the stomach, and should always be examined for functional disorders, stricture or rupture, and foreign bodies.

Diaphragm should be examined for foreign bodies and for rupture, such as is brought about by violence or the penetration of a broken rib.

The Spleen is composed of the arteries and lymphatics, and should be examined to see whether it is abnormally congested or enlarged as in anthrax, redwater (and malaria in man). If the spleen is ruptured or the contents have the appearance of raspberry jam, great care should be taken in the handling of it that no wounds on the hands of the examiner may be contaminated, as it might be an anthrax spleen.

Stomach.—The horse's stomach is composed of a single compartment, and should always be examined for rupture or bots and vegetable and mineral poison. The stomach of the ox is situated between the end of the oesophagus and the beginning of the intestines. It is composed of four compartments, namely:—

(1) The Rumen or Paunch (Grootpens); (2) Reticulum or honeycomb (Kleinpens); (3) Omasum or many-piles (Blaarpens); (4) Abomasum or Rennet, the true stomach (Miltpens).

It is always interesting to thoroughly examine the various compartments of the ox's stomach, as one never knows what one may come across. Indeed, many strange things are found in the rumen and reticulum of cattle, and it is on record that a healthy cow, which had never been ill and which was one of the best feeders, devoured—one after another—a pair of cotton stockings, cheese wrapped in a cotton cloth, a waistcoat with metal buttons, a child's merino frock, and a woman's calico jacket (with the exception of the sleeves). Personally, I have never come across an animal with such a perverted taste as the one described, but I have often found old boots, tins, spoons, leather traces, pieces of umbrellas, earth, wire, pins, and needles. The rumen, particularly in lambs, should be searched for wool balls, and in calves for hair balls. The capacity of the rumen of the ox is 50 gallons.

The Reticulum should be examined for congestion, as this is often well marked in cases of mineral poison, particularly lead poison.

The Omasum is often congested in vegetable poisoning and impacted in cases of blood diseases, and the contents dry and hard as in stopziekte.

Abomasum is often the seat of marked ulceration and inflammation, as seen in rinderpest. Note that this stomach is also the seat of wire-worm in the ox and sheep.

Liver.—The liver is situated on the abdominal side of the diaphragm. Its colour and condition should always be noted, and especially in small stock should it be carefully examined for the disease fluke. The condition of the gall-bladder should be noted as to whether markedly distended and the consistence of the bile remarked.

Note.—The horse has no gall-bladder.

The Intestines should be examined for congestion, and the wall of the intestine searched for nodules, especially for caseous nodules in the sheep and goat; the contents of the intestines should also be searched for parasites.

Rectum.—The rectum is markedly streaked in rinderpest.

Nostrils.—The nostrils should be examined for any discharge or ulceration in the nasal chambers as seen in glanders.

Larynx and Trachea should also be examined for ulceration, especially in glanders, and for parasites, as those causing Husk or "Hoose" in calves.

Thorax.—On opening the chest it should always be noted whether it contains fluid or not.

Pleura.—The pleura should be examined for signs of pleurisy or nodules of a parasitical or infectious nature as those of glanders.

Lungs.—The lungs may show congestion or extravasations of blood; also various types of pneumonia may be seen, varying from the pneumonia seen in horse-sickness to that characteristic of lung-sickness. In sheep a peculiar form of pneumonia is sometimes seen, known as chronic catarrhal pneumonia.

The lung is also the subject of tubercular nodules as seen in acute cases of tuberculosis of the ox.

Note.—A healthy lung should float in water.

Heart.—The heart should always be examined for foreign bodies and for any disease of the valves, such as valvular heart-disease due to rheumatism. The quantity and quality of any fluid existing in the heart sac should be noted, as it is often indicative of the disease heart-water.

Extravasation of Blood should be noted on the inner lining of the wall of the heart in cases of horse-sickness. Hydatids or bladder-worms are often found in and around the heart. The heart of the pig is often the seat of measles.

Note.—The heart of the ox has a small bone in it which distinguishes it from that of the horse; it is also half the size of the horse's heart.

Kidneys.—The kidneys should never be overlooked, and should always be removed from the carcass for examination and the capsule or covering carefully separated or removed and a thorough search made on the substance of the kidney for congested or red areas, also for white spots raised above the surface of the kidney (infarcts), which are particularly noticeable in East Coast fever.

Bladder.—The condition and colour of the urine should be noted.

Generative System.—The generative system of the male does not concern us to any great extent in the diseases of this country. The female organs, however, should always be examined—the uterus for inflammation, metritis, and rupture; the vagina for discharges, laceration, or rupture; the udder for inflammation, mastitis, or pustules, or papules, as seen in sheep-pox; the milk should also be examined for any alterations and for the presence of blood.

Brain.—It is not often that the brain is opened for examination, but when it is one looks for congestion, such as is very noticeable in cases of rabies, swine fever, cattle plague, anthrax, and septic affections. It is also searched for tumours and hydatids.

Note.—In making post-mortems in hot weather, and especially when flies are numerous, if the animal is suspected to have died from anthrax or glanders, act circumspectly, and let the hands be well washed after completing the examination.

GESTATION PERIODS.

In conclusion, the following table of utero-gestation periods, taken from Fleming's *Veterinary Obstetrics*, may be of interest:—

Animal.	Average Period.	Early Period for Young to Live.	Late Period.
Mares	335–345 days (11–11⅓ months)	307 days (10 months)	365 days (12 months)
Cows	275–287 days (39–41 weeks)	242 days (34½ weeks)	312 days (44½ weeks)
Sheep and Goats ...	149–151 days (21–21½ weeks)	140 days (20 weeks)	160 days (23 weeks)
Sows	112–119 days (16–17 weeks)	105 days (15 weeks)	126 days (18 weeks)
Bitches	63 days (9 weeks)	55 days (8 weeks)	70 days (10 weeks)
Cats	55 days (8 weeks)	50 days	64 days
Rabbits	28–30 days (4 weeks)		

The duration of pregnancy is usually shorter in weakly, ill-conditioned, and poorly-fed animals than in those of an opposite state.

It also decreases with age. It is also said to be shorter in highly-bred animals than in common-bred ones.

The period of utero-gestation is supposed to be longer with a male foetus than it is in the case of a female, although the longest periods registered appear to have been with female young. Mares put to thoroughbred horses appear to be longer pregnant than when impregnated with common-bred stallions; and a mare fecundated by a stallion ass goes longer than when put to a horse.

Hints on Holding a Post-mortem Examination.

By THOMAS H. DALE, M.R.C.V.S., Government Veterinary Surgeon, Potchefstroom.

MOST Government veterinary surgeons have a district so large in extent that it is often impossible to get to a reported outbreak of disease in time to make a satisfactory post-mortem examination. The farmer then in these cases has to do the best he can, and there is not a day passes but what every Government veterinary surgeon receives one or more letters asking for information about some disease or other. In the majority of cases the farmer describes what he saw when he opened the dead beast. The information is often, however, very meagre, and is as often as not a description of a perfectly healthy condition, or of some condition which is of little or no diagnostic value, lesions of importance often being missed, and many of the most important organs in the body never mentioned. I therefore propose to outline the best method of conducting a post-mortem examination, point out what to look for, and advise as to the best method of sending specimens of blood, organs, etc., for examination. The history of the disease is always of very great importance in enabling one to arrive at a correct diagnosis, so the report should state the length of time the animal has been sick, whether any others are sick or dead, and if so, the number, whether any of the sick or dead have been off the farm recently, and whether any fresh stock has been recently introduced, and if so, from where; also whether any dipping of cattle or sheep has recently taken place, and if so the brand of dipping material used; a description of the symptoms exhibited during life should then follow, and should be as full as possible, everything that departs from the normal being included, as many little things which do not appear to be of importance to the farmer often give us the key to the situation. In making the post-mortem examination itself, a good sharp knife and a meat saw are required, not forgetting a bucket of disinfectant solution, which may be Jeye's fluid, or any of the fluid sheep dips in common use, and into which the hands should be frequently dipped, for the fact must not be overlooked that glanders, anthrax, malignant oedema, and all the so-called blood poisonings are communicable to man, and that the majority of these are fatal. A note should first be taken of the external appearance of the animal, whether fat or in poor condition, recently dead or not; whether there is any discharge from eyes, nostrils, mouth, anus, etc. Should there be blood at the nostrils and anus of a recently dead animal, anthrax will be suspected; the animal should not be opened, and the matter should be reported

to the police, who may make an incision on the margin of the ear and take a blood smear, which they will send to the Government veterinary surgeon or to the Bacteriological Laboratory for microscopic examination. There is a heavy penalty imposed by law on any person contravening the regulations on this point, but the history of the case—the duration of the fatal illness—will materially assist in such a case. Should the beast have been sick for some days it is hardly likely to be anthrax, as in this disease if the animal is noticed to be sick at all it is usually only just before death takes place. Having made a note of all there is to see externally the animal may now be opened. This may be done in either of two ways, either lying on the back or on the side. In the former the carcass should be propped up and the hind legs held by helpers, the fore legs may be allowed to drop by cutting the muscles which join them to the body. An incision is then made with the knife right along the middle line of the belly, taking care not to cut any of the bowels, then cut down the flank on each side almost down to the backbone, and lay the flaps back, thus exposing all the internal organs. Now saw between the hind legs, which will enable them to fall to the ground, and the urinary bladder will be exposed to view. To open the chest, instead of sawing or chopping through the breastbone, a better plan is to saw through the ribs about half way between the breastbone and the backbone; after, of course, skinning the part and cutting the flesh off it. After lifting up the breastbone with its attached portions of ribs, the contents of the chest cavity can be seen *in situ*, and by this method there is less risk of one scratching oneself with the sharp sawn bone in endeavouring to remove the heart and lungs. Another method is to lay the animal on its side, and after skinning and removing the muscles (flesh) from the ribs, the latter are sawn through close to the backbone and also close to the breastbone, the whole side is then removed with the knife, thus exposing to view both the chest and belly cavities. Whichever method is adopted, before cutting anything draw out the bowels and carefully note whether anything abnormal exists; then cut each organ from its attachment and examine it separately.

In cattle and sheep it is best to open the fourth stomach (klein or melk pens) first and not last as is usually done; it is very much easier to find before the first stomach (groot pens) has been cut into, which is invariably full of unmasticated food, and makes a great mess. I usually leave this stomach until last of all. After opening the fourth stomach, careful notice should be taken as to whether it is inflamed or not, and if the subject is a sheep look for the presence of wireworm (haarworm), or in the case of a horse for bots (paapjies) and the large round worm (*Ascaris megalacephela*). None of these may be the cause of death, but they will indicate to the observant farmer that his other animals will almost certainly be infected in like manner, and point to the necessity for immediate treatment with a view to their removal. The third stomach (blaar pens) is invariably described as being dry and containing partly digested hard food, but this is

more or less a normal condition, for although one does get impaction of this stomach (stopziekte) its contents are always dry, as one of its functions is to press out the semi-fluid portion, which is then ready to be acted on by the juices of the fourth or true digestive stomach. It is very seldom that there is anything wrong with either the second (bloem pens) or the first stomach (groot pens), except from the presence of foreign bodies, which should always be felt for, as it is very easy to miss seeing a piece of sharp wire or a needle mixed with or embedded in the contents of these stomachs.

Perforation of both these stomachs is quite common, and may cause peritonitis or an abscess, or may penetrate the chest and pierce either the lungs or the heart, giving a very similar appearance to some of those old standing cases of lung-sickness which used to be so common at one time, but which we so seldom see nowadays in the Transvaal. Death also occurs owing to an obstruction between either the first and second or the second and third stomachs, and the hand should be inserted into the openings between these stomachs with a view to finding out whether a foreign body is fixed there or not, the commonest articles found being nails, pieces of wire, Kaffir needles, pieces of leather, etc. This condition is the cause of very many more deaths than is generally supposed, many of which are put down to lamziekte and gall-sickness.

The spleen (milt) which is attached to the stomach is often affected in this country as a result of anthrax, East Coast fever, South African redwater, gall-sickness, etc. When healthy and cut in half it should present a clean-cut surface with sharply defined edges, but in anthrax and the other diseases mentioned it may be enormously enlarged and its substance of the consistence of jam. In anthrax it is usually black in colour; in gall-sickness usually red. In both cases the margins of the spleen, instead of being thin and sharp as they should be in health, are thickened and rounded.

The liver should then be examined and should be found of a healthy brown colour, but in redwater and gall-sickness it is often very yellow, due to it being stained with bile, as are most of the tissues of the body in these diseases, but if the animal has been sick for any length of time it may even be clay-coloured. It is also necessary to see if there are any abscesses or other growths. If there are, cut into them and make a note of what they contain. The gall, contrary to what is generally believed, tells us very little; the quantity and quality of its contents depend largely on whether digestion is going on or not. If it has been suspended for two or three days the bile may be high coloured and thickened. In East Coast fever it often looks like chewed grass, but any condition we may find is not very diagnostic of any special disease in particular. The majority of farmers appear to think that the gall bladder is a secreting organ, and are surprised when informed that it is merely the reservoir of the liver; that the bile is one of the digestive fluids, and that the amount contained in the bladder entirely depends on whether it is being used at the same rate that it is being secreted. In

the case of the horse, which has no gall bladder, the bile is emptied direct into the small bowel.

The kidneys may next be examined and cut open to see if there is a stone (*calculus*) or if they contain pus. The urinary bladder can now be examined and cut open. Notice whether the urine which it contains is normal in colour or whether it is red, as it is sometimes in redwater; also whether any calculi are found, especially at the exit. The bowels, which have already been dragged aside, may now be opened from end to end, and anything out of the common noticed. This leaves the belly cavity empty, and the heart and lungs will be the next organs to demand attention. Note whether the lungs are grown to the ribs, and whether the chest cavity contains fluid or not. If it does, make a note of whether it is clear or contains pus. Note whether the surface of the lungs is clear and bright or discoloured and its membranes thickened. On cutting into them note whether they are spongy and healthy or solid and liver-like; also whether there are any abscesses or bladder-like cysts containing a watery fluid. Many farmers recognize the peculiar and characteristic marbled appearance so diagnostic of lung-sickness, but many others call every diseased condition of the lungs by this name. It is perhaps just as well to make a mistake on the safe side and to take every precaution until the portion of lung has been submitted to the Government veterinary surgeon for his opinion. It will often be found in perfectly healthy lungs that one lung is of the normal pale yellow pink colour, and that the other is a dark red or even almost black, and this condition is often reported as inflammation of the lungs or zwaart lungziektie, but the explanation is that the darker lung is the one on the side on which the animal lay when it died, and the engorged condition is simply due to mechanical congestion due to the blood gravitating to the lowest portions of the body. Another quite common condition is a broncho pneumonia, which is characterized by froth in the tubes and an inflammation which is patchy in character; portions of the lung being healthy with well-defined inflamed areas which are most commonly found in the lower part of each lung. This condition is invariably caused by medicines or drenches of one kind or another having "gone down the wrong way" owing to careless administration, or in the case of the horse to the fact that the drench has been poured down the nostrils, the result of an ignorant belief that the right nostril leads to the lungs and the left one to the stomach. There is, of course, no foundation for this extraordinary fallacy; both nostrils are the external openings of the air passages and have no connection with the stomach whatever; and it is remarkable that many, who on their own telling have made hundreds of post-mortems, have failed to discover for themselves that each set of organs, those of respiration and digestion, has each a separate pipe or tube to supply in the one case, air, and in the other food. These tubes will be found lying side by side and can be easily distinguished, as the one to the lungs (trachea) appears to be corrugated owing to its cartilaginous rings and is non-collapsible, while the

other (oesophagus or gullet) looks like an empty pneumatic bicycle tube and only expands during the passage of food or fluids. It has to be admitted that there are numbers of these cases which survive, but in these the amount of cruelty and the pain inflicted ought to be sufficient to put a stop to this practice. At one time or other one must have experienced the extreme discomfort occasioned by a crumb having " gone down the wrong way ". Let us try and imagine then the effect on a delicate mucous membrane of some of the wonderful concoctions in daily use and which invariably contain at least one irritant. Only those who are continually in attendance on sick animals and making post-mortems can have any idea of the number of animals that are annually sacrificed by this means, the owner in practically every case attributing death to the disease, either real or imaginary, from which the animal was suffering. And here it may be as well to point out that probably in no other country in the world are so many animals killed by amateur doctoring. There is an old saying that " a little knowledge is a dangerous thing ", and in the case of the practice of medicine this applies with doubled force, and if the average farmer would devote more attention to the study of " nursing " sick animals and less to dosing he would save many more animals than he does at present, the majority of which recover, not because of the medicine but in spite of it.

The apology for this digression must be the importance of the subject and the urgent necessity for stamping out a practice which causes so much suffering to the animals and loss to the individual owner and the country in general. The heart appears to be seldom examined, but should always receive attention, a note being first made of the amount of fluid in the heart sac, whether normal or an increase, and whether it is clear and limpid, sherry-coloured red, or containing pus. If the latter, look for a sharp-pointed object, a needle, for instance. In some of the blood diseases, like redwater, the heart is found to be spotted about its base where the large blood vessels leave it. This spotting is very marked in some cases, and similar spots are found in other organs and tissues of the body, but are likely to be overlooked. Biliary fever in the horse belongs to the same class of disease as redwater in cattle, and these spots on the heart are very marked. They can also be seen during life on the membrane in the inner corner of the eye, and their presence in conjunction with the bile-stained visible mucous membranes will enable one to be confident of his diagnosis. There are, of course, many more organs that a veterinary surgeon might consider it necessary to examine under certain circumstances; for instance, the brain, lymphatic glands, etc., but in the ordinary way this will be unnecessary. Blood smears are, however, always of use to assist us to form a correct diagnosis, but unfortunately are often not made according to instructions. The correct method, if the animal is alive, is to well clean an ear, and prick one of the prominent veins on its upper surface with either a needle or a sharp knife. As soon as the blood flows the smear must be made at once, for if it coagulates the smear

will be a failure. If the smear is to be made from a dead animal, make three smears, one from the heart blood, one from the spleen, and another from the liver; in fact from wherever taken it is always best to send two or three as it admits of several different methods of staining and consequently a more thorough examination. The necessary glasses may be obtained from the field cornet, or at the nearest police station or post office, and should be thoroughly cleaned and polished with a clean cloth or handkerchief immediately before use. To make the film, only a very small drop of blood is needed; people generally make them very much too thick. This drop is allowed to fall near one end of the slide, and it is then smeared along the glass to the other end, using the end of another slide for the purpose, then allow it to dry in the air, but shaded from the direct rays of the sun. When dry wrap up each slide in a separate piece of paper, even if they are from the same animal, writing on each one the organ from which taken and the name and description of the animal. On no account place another glass over the film whilst it is wet, as the glasses will stick together and it is impossible to get them apart again without destroying the film. Frequently one receives a quantity of blood in a bottle: for several reasons this is useless for diagnostic purposes, and generally arrives in a high state of decomposition.

When an animal is suspected of dying of quarter-evil (sponziekte) a deep incision must be made into the infected quarter and the smear made from the *juice* of the swelling, as the organism which is the cause of the disease is not found in the blood. If it is desired to send a portion of a diseased organ, a growth or similar specimen, for examination, the best plan is to soak a piece of clean rag, cotton wool, muslin, or similar material in a 4 per cent. solution of formalin if available, or failing this, in a solution of disinfectant or sheep dip, and wrap the specimen in it, then place in a fruit jar or tin canister and fasten tightly. This is much better than placing the specimen in a solution, as the specimen keeps quite fresh and the preservative does not soak into the specimen and spoil it for examination purposes. In *all* cases of death from disease, the animal should be buried deeply, and it is safest to make a bonfire of bush, etc., over the grave. It is much simpler to leave the carcass for the aasvogels to dispose of, but the bones remain, and when they are dry are picked up and chewed by stock, and should the skeleton be that of an animal which has died of anthrax or quarter-evil, etc., another outbreak is the result; in fact I have no hesitation in saying that 90 per cent. cases of anthrax in the Transvaal are contracted in this manner. In all diseases prevention is better than cure. In this case it is doubly true, for there is no cure.

Winter Feed for Stock.

By E. J. MACMILLAN, B.S.A., Department of Agriculture, Bloemfontein.

(Review of a paper read at meeting of the Judges' Association.)

THE problem of winter feed for stock demands increased attention year by year. In time past when the farms were larger it was not so necessary for the farmer to provide extra feed. The heavier stocking of farms and the development of dairying now render feeding essential to successful farming. Many of the losses in sheep during the past season might have been averted if farmers had taken the trouble to sow a suitable crop in the previous summer.

Crops for the production of winter feed may be divided into two classes—those which are pastured or fed off the ground and those that are stored until required. The advantages of the first-named class will appeal to the average farmer who has not the means at hand to store feed.

GRASSES.

The search for a suitable winter grass for the high veld has been fairly successful in certain districts, while in others no results have been obtained. The grasses which are most resistant to drought do not as a rule withstand frost. Some grasses have been found to make a good growth in the first season, but before the lapse of another year they have been almost smothered by wild grasses and weeds. The veld grasses which have persisted under natural conditions are all susceptible to injury from frost and are cut down at the approach of winter, so that it is very difficult, if not impossible, to find a variety equally resistant to drought and frost.

There are several grasses, however, which have been established in this Province and promise to afford a fair amount of winter pasturage. Especially in the eastern districts, with their sour veld, the question of establishing more palatable grasses for pasturage is very important.

PASPALUM.

This grass has been successfully grown in Natal for several years, and has recently been introduced into the Harrismith district with good results. It is a very persistent grass and stands drought, close grazing, and tramping, apparently without injury. It is quickly cut down by frost, though it furnishes considerable green undergrowth throughout the winter season. There are grasses which withstand frost better, but few, if any, last so well. In a favourable season a crop of hay may be cut and a second growth will come up for winter feeding. When sown alone about 8 lb. seed should be put on an acre.

Mr. J. J. de Jager, Loskop, Harrismith, has succeeded in establishing a large acreage which he has used for hay and winter pasturage for sheep with excellent results.

COCKSFOOT.

This is a hardy, tufted grass which stands frost and succeeds well on poor soil. The quality of the herbage is excellent either as pasture

or hay, provided it is not allowed to get too old. Fifteen pounds seed should be sown per acre. Cocksfoot may be seen to advantage on the farm of Mr. Geo. Petty, Harrismith.

TALL FESCUE.

This variety grows in tufts and has sometimes been called Tussock grass or Southey's grass. It is a hardy persistent grass which stands frost and will live throughout a severe drought. The herbage is hard and somewhat coarse, but nutritious. Sow 15 lb. per acre.

RYE-GRASSES.

Perennial Rye is a quick grower and resists frost, but is inclined to die out after the second year. It is worthy to be included in a mixture for its early growth.

Italian Rye produces more herbage in the beginning than the first mentioned, but is not so persistent.

Poverty Bay Rye-grass, a variety now being introduced from Australia, is said to be hardier and more lasting than the other kinds. Sow 20 lb. Rye-grass per acre.

RESCUE GRASS.

This is commonly found growing in orchards and in other shady spots, where it thrives exceedingly well. It is not so good sown on the open veld, but it is nevertheless hardy in frost and makes a fair stand. If sown alone about 15 lb. seed is required per acre.

TALL OAT GRASS.

This is a hardy drought-resisting grass worthy of more extended cultivation. It is tufted in character, as are all the most suitable winter grasses for the high veld. Tall Oat makes an early spring growth, and in favourable seasons may be cut for hay. When sown alone 20 lb. seed is required per acre.

SEEDING GRASSES.

Grass seeds should be sown late enough in the season to escape hot dry winds, and sufficiently early to get a start before frost. February meets these conditions best. This time is late, however, for the production of grazing during the first winter, except from the Rye and Rescue grass. In the moister portions of the Province, notably in the Harrismith district, the grass seeds have been sown in the mealie crop during November and December with good results. The mealie stalks protect the young grass plants, and provided sufficient moisture is present in the ground a satisfactory growth is made and grazing secured for the following winter season. Sowing the seed just before the last cultivation is given to the mealie crop is good practice in the drier country. A small plot established in this manner at Grootvlei in 1907 still shows a fair amount of Tall Fescue and Paspalum.

If the grass seed is to be sown alone the ground should be carefully prepared when it is in a moist condition, the object being to secure a fine seed-bed free from large clods. A mixture of grasses is to be preferred for several reasons. Some come earlier than others, some are more susceptible to injury by frost, and others do well for a year or two and then die out, making space for the more persistent varieties.

The cost of the seed of many varieties is an obstacle to the establishment of introduced grasses. The hardy sorts spread of themselves, and a heavy seeding such as might be given on a well-watered meadow is not practicable for veld conditions.

The following seeding is recommended per acre :—

	Quantity.	Approximate cost. s. d.
Paspalum	3 lb.	3 0
Cocksfoot	3 lb.	3 0
Tall Fescue	2 lb.	2 6
Tall Oat Grass	2 lb.	2 6
Lucerne..	2 lb.	2 6
Burnet	2 lb.	1 6
Sainfoin..	2 lb.	1 6

The last three, though not grasses, afford a certain amount of pasturage and are worthy of being included.

The estimated cost per acre for seed would be 16s. 6d. This will vary according to the quantities purchased. The seed should be sown broadcast and covered with a light harrow.

Phalaris bulbosa, the new Canary grass, flourishes under cultivation and is not injured by frost. It has not yet been proved under veld conditions, and, besides, the seed is somewhat costly for it to be included for a general crop.

WINTER OATS.

In the grain-growing districts Winter Oats may be used to provide pasturage, especially for sheep, during a great part of the winter season. The English Winter (dun coloured grain) is a suitable variety to be sown for this purpose. The seed should be put in the ground about 1st March ; in the average season the crop will then be ready for stocking in the beginning of June. Thirty-five pounds of seed is sufficient to sow an acre, or a sack to four acres. The crop may be fed off bare up to 15th August, and when the season is favourable a crop of grain may afterwards be secured. It is not advisable to keep stock on the crop later that 15th August if importance is attached to the grain harvest.

LUCERNE.

Any list of fodder plants recommended for South Africa would be incomplete without Lucerne. Though not a strong winter grower Lucerne pushes up rapidly in early spring and furnishes good feeding before the veld can make a start. The value of Lucerne hay for stock in winter is already well understood. This crop promises to prove valuable for cultivation on dry lands, though it is eminently suited to be grown under irrigation. When grown without water it cannot be expected to yield a large cut of hay, but its value for pasture will more than repay the cost of preparing the ground and purchasing seed, and in favourable years a cutting of hay may also be secured. On dry lands sow the seed in rows about 24 inches apart.

BURNET.

Burnet is a hardy perennial which withstands frost and makes a good growth in the winter season. It is inclined to become woody when

mature, but it is nevertheless valuable as a food for sheep. It is one of the most successful of the new perennials introduced. The quality of pasturage is very fair. Its chief value lies in the fact that it grows and remains green throughout the winter and during severe drought.

To produce winter pasturage Burnet should be sown in January. Better results have been obtained from sowing in 18-inch rows than from broadcast seeding, though the latter has by no means proved a failure. About 15 lb. seed should be allowed per acre.

The following yield was obtained from a small plot of Burnet established at Grootvlei, Bloemfontein :—

Date of Cutting.	Weight of Green Crop per acre.
23rd September..	5650 lb.
21st November	1400 lb.
25th January	3000 lb.

The cutting made on 23rd September was mainly the result of winter growth, and serves to show how this plant produces in the early spring.

SAINFOIN.

Sainfoin furnishes feed of finer quality and is more readily eaten by stock than Burnet, and being one of the Leguminosae it is also a better soil improver. It has been successfully established as a field crop at Grootvlei, and furnished a lot of feed for lambs at weaning time in October last. Sainfoin is a perennial and withstands frost.

Three cuttings were obtained from a small plot at Grootvlei last season, the yield of green fodder being as follows :—

Date of Cutting.	Weight of Green Crop per acre.
5th September	5100 lb.
10th November	1500 lb.
20th January..	2250 lb.

Sainfoin has proved about equal to Burnet in the amount of fodder produced. The heaviest cutting, it will be observed, was the first, showing good winter and early spring growth. Sowing in the latter part of March is to be recommended. The quantity of seed required per acre is 20 lb.

SALTBUSH.

Australian Saltbush has proved its value as a forage plant in trials made at Grootvlei during the past five years. It is a splendid drought resister when once established, and it is available as feed for cattle and sheep either in times of severe drought or in the winter when the veld is brown and bare. Saltbush is particularly valuable for planting on shallow brak soils, where many other crops will not grow, and owing to its drought-resisting qualities it is well suited to the western portions of the Province. One variety, Old Man, stands out ahead of all others as the most suitable Saltbush for cultivation under our conditions. This grows to a height of six feet with branching woody stems, but bearing an abundance of shoots which are much relished by stock. Saltbush seed has been distributed to farmers throughout the Province with varying results. Some have succeeded in establishing it, while the majority have reported failures. In the latter case the difficulty appears to have been

largely due to wrong or doubtful methods of planting. To ensure success the seed should be sown in tins about September month, and when the plants are well up they should be transplanted into other tins or nursery beds, and finally set out in the ground when they are strong and in a flourishing condition. January or February, as rains permit, is the most favourable time for planting out. The ground should be well prepared previously by ploughing and harrowing. It is necessary to keep stock off the plantation for the first year.

RAPE.

Rape is king among winter forage plants for the sheep farmer. When sown at intervals from 15th February to the end of April it can be relied on to produce a satisfactory growth, and will furnish a supply of green fodder throughout the winter season. There are two essential conditions necessary in the production of Rape—moisture to ensure a start for the crop, and a fairly fertile soil. Though it will grow on poor soils it is not a satisfactory crop. Even in the driest portions of the Province there is generally enough moisture in the ground at the end of February to give Rape a start. It is therefore suitable for general cultivation. If possible the ground should be ploughed and lie fallow for at least a month before seeding. The Rape plant attains full growth in three months from seeding. Thirteen tons of green crop per acre were produced at the Grootvlei Experimental Farm from a plot sown on 1st March. This piece of ground was well enriched with stable manure. Much less, or one-third of the above-mentioned yield, would furnish a profitable return as pasturage. For winter feeding Rape should be sown in time to make a good growth before frosts set in. The plant is not injured by frost, but it grows very slowly in cold weather. To provide for early spring feed it is advisable to sow the seed in April.

The crop succeeds best grown in rows, which should be about three feet apart, but the seed may also be sown broadcast with satisfactory results. The quantity of seed required is 5 lb. broadcast or 2 lb. in rows.

When sown in rows and cultivated Rape makes a strong growth, and may be cut and drawn to a paddock or yard for feeding, otherwise it may be treated as a pasture crop. Sheep may be conveniently pastured on Rape enclosed in a field made of hurdles or wire-netting, a small piece being allowed at a time, and the enclosure being removed to a fresh portion of ground daily. This system, though somewhat troublesome, is the most economical of feed and also enriches the soil.

This crop is very suitable for ewes with winter lambs, but it may be fed with advantage to all classes of sheep, pigs, and cattle, except cows giving milk. It is a valuable fattening food.

Care is necessary when stock are first turned into Rape to prevent bloating. They should not be allowed to gorge themselves with it, and half an hour's feeding at first is enough.

MANGELS.

Mangels are another useful crop which does not require storage, but may be fed from the field. These roots are particularly valuable for cows in milk and for pigs, but may be fed to sheep as well.

The Mangel requires a long season in which to complete its growth, and it should be sown not later than November. The roots will then be ready for feeding at the 1st of June. In trials made at the Experimental

Farms, Mangels have proved superior to all other root crops in respect of drought-resisting qualities and yield. Turnips have also given good crops in some of the eastern districts.

During the season of 1908-1909 as much as 26 tons per acre was obtained of the Giant Sugar Mangel.

STORED CROPS.

HAY.

Few farmers take advantage of the opportunities afforded by the summer crop of veld grass to store hay for winter feeding, yet this furnishes much valuable feed if cut at the right time. The only special implements required are a mower and a rake. The great secret in making good hay is to cut the grass early, before the stems have had time to become hard and unpalatable as feed. The common Rooi grass, which forms the bulk of veld hay, should be cut whenever all the heads are fully up. Stacking is a perfectly satisfactory method of storing hay until it is required. In fair weather grass cut in the morning may be raked together in the afternoon and drawn to the stack on the following day.

TEFF GRASS HAY.

Teff grass is an annual and valuable as a hay crop. It is of no advantage to use it for pasturage in the summer season, when veld feeding is good, and it is of no value for winter grazing, as it withers after the first frost. The seed may be sown in October, and if rains are favourable the grass can be mowed twice in one season. In the portion of the Orange Free State where rains are usually late it is suitable to be sown in January, and will then produce one cutting, which requires about ten weeks' growth.

The soil for Teff requires careful preparation by ploughing and harrowing until a fine surface is obtained. Then the seed should be sown broadcast at the rate of 3 lb. per acre, and covered lightly by means of a light harrow or weeder.

Upwards of two tons of hay per acre have been obtained from this crop at Grootvlei during favourable seasons. Teff possesses a high value as a fodder, and commands a good price on the market.

ENSILAGE.

Any system of winter feeding which does not embrace ensilage may justly be considered incomplete. A well-filled ensilage pit or silo affords the stock farmer a means of tiding over many a period of drought or dry winter veld without loss of flesh or milk in the herd. Ensilage is pre-eminently a cattle food, and it may also be used in limited quantity as sheep feed. Almost any green crop may be made into ensilage, but all things considered there is no crop so suitable for the purpose as mealies.

In the Orange Free State few seasons are so unfavourable that it is impossible for the farmer to grow mealies for ensilage. It should be borne in mind, however, that mealies half grown, green, and filled with water make feed of very poor quality, and that the crop should be approaching maturity before it is cut and placed in the silo. Ensilage has sometimes been condemned owing to the fact that it was made from an immature crop, which was no fault of the system.

Mealies for ensilage may be planted as late as 1st January, but it is better to place the limit of planting a month earlier, as the prospects

of securing a well-matured crop and getting it gathered before frost are thereby much improved. A little frost causing withering of the leaves does no harm. For good ensilage the material should retain much of its green colour and be free from any trace of mould. Its characteristic odour is like that of fresh malt.

A mealie crop which will yield five bags of grain per acre produces approximately five tons of ensilage. Ten tons per acre of ensilage fodder may easily be obtained in a favourable season on good land. Four tons of ensilage are equal in feeding value to one ton of good oat hay.

It has been shown by experiments at the Tweespruit Experimental Farm that the cost to grow mealies and store the crop in the silo does not exceed ten shillings per ton. The comparative cheapness of a ration based on ensilage is here made apparent.

Another advantage of this form of feed is that it can be kept from one year to the next without loss by deterioration. If the contents of the silo be not all required in the course of winter feeding the material will be found very useful during a summer drought.

Ensilage forms an excellent feed for the dairy cow, and can be recommended to farmers in the dairying districts without hesitation. The storing of ensilage is one of the most necessary steps towards the development of milk production in winter. Doubtless many stockmen are deterred from making ensilage owing to the cost of providing a silo. A building is not altogether necessary for the storage of this feed, though it is advisable. A pit made on a hillside with a rough stone wall carried up ten or fifteen feet above ground is quite satisfactory, and can be constructed at small cost with farm labour. A silo to hold 100 tons can be built for £40. Where no such provision can be made the mealies may be stored in a stack, due care being taken to see that the stems are laid on evenly around the outside and packed as firmly as possible. When the stack has been made as high as convenient a covering of stones or earth, about 2 feet in thickness, should be placed on top for the purpose of weighting the mass down and expelling the air, thereby preventing decomposition.

It is out of season for the farmer to establish many of the winter crops described, but it will be observed that there are several to which attention might be given at once to provide feed for the coming winter season.

Land should be ploughed for Rape at the earliest opportunity and kept harrowed until the time for sowing the seed, which is from 15th February and onward to 1st April.

Land should also be prepared at once for Winter Oats to be sown at the middle of March. It is important to have the ground ploughed and fallowed to conserve the summer rainfall.

Besides, winter grasses may be sown on prepared ground or in portions of the mealie crop where the land can be devoted to grazing.

To be successful with stock the farmer now must feed during certain periods of the year, and preparation should be made in advance to grow and store stock food. Many farmers do not realize that it pays better to feed mealies, hay, etc., than to sell them at market prices, yet in many cases this is true. One feels that the importance of growing stock food and storing it for times of need cannot be too strongly emphasized in this country with its rapidly expanding live stock industries.

Cotton Growing in the Cape Province.

By ALFRED VAN RYNEVELD, Assistant to the Government Agriculturist, Cape Province.

THE cultivation of cotton in the Cape Province is at present attracting a great deal of attention locally, and it is interesting to note that it is also attracting attention oversea. As an instance of this, a request was received from the Imperial Institute of the United Kingdom, the Colonies, and India, that specimens of ginned and unginned cotton grown in the Cape Province be sent to them for examination and addition to the reference collection of British cotton already in their possession. In compliance with this request, I collected a few specimens of material then available.

The following are descriptions of the specimens collected and forwarded, together with the report of the Imperial Institute thereon:

(*a*) *Egyptian Abassi*, grown by General Brabant at his farm Amalinda, ten miles from the coast, in the District of East London.

REPORT.—*Weight*: 2 lb. 12 oz.; ginned cotton, fairly soft, lustrous, clean, of cream colour, and free from stains.

Strength: Rather weak.

Length of Fibres: Irregular, from 1.0 to 1.6 in., mostly from 1.2 to 1.5 in.

Diameter of Fibres: From 0.00055 to 0.00100 in., average 0.00074 in.

Microscopical Characters: Some immature fibres were noticed.

Commercial Valuation: 11¾d. to 1s. per lb., with good Egyptian Abassi at 1s. 2½d. per lb.

Remarks: This sample was of fairly good quality, and such cotton would be readily saleable in the English market.

(*b*) *Egyptian Mitafifi*, grown by Mr. R. Bryson on the Lower Gonubie River, in the District of East London, half a mile from the coast.

REPORT.—*Weight*: 2 lb. 7 oz.; ginned cotton, fairly soft, lustrous, and clean, and white to cream coloured, with a few pale brown stains.

Strength: Fairly good.

Length of Fibres: 1.2 to 1.6 in., mostly from 1.2 to 1.4 in.

Diameter of Fibres: From 0.00050 to 0.00085 in., average 0.00071 in.

Microscopical Characters: Some immature fibres were noticed.

Commercial Value: 11½d. per lb., with "good" Egyptian Abassi at 1s. 2½d. per lb.

Remarks: This sample did not possess the brown colour characteristic of Mitafifi cotton, but closely resembled the Abassi type.

NOTE.—An interesting feature with regard to this sample, which was picked by me personally, is that it was only picked four months after it had ripened, and during that period was exposed to several strong showers of rain, violent wind and dust storms, and received practically no attention after it was planted and was almost smothered in weeds.

(*c*) *Egyptian Abassi*, grown on the same farm as Sample (*a*).

REPORT.—*Weight*: 6 lb. 5 oz.; ginned cotton, fairly soft, lustrous, clean, of cream colour, and practically free from stains.

Strength: Generally good, but some portions of the sample were rather weak.

Length of Fibres: 1.3 to 1.6 in., mostly 1.4 to 1.5 in.

Diameter of Fibres: From 0.0006 to 0.0010 in., average 0.00075 in.

Microscopical Characters: Some immature fibres were noticed.

Commercial Valuation: 1s. to 1s. 0½d. per lb., with "good" Egyptian Abassi at 1s. 2½d. per lb.

Remarks: This sample was of good quality, and such cotton would be in great demand on the English market.

(*d*) Cotton grown from *Egyptian Abassi* seed. Grown by Mr. W. Matthews, Willowvale, Transkei Native Territories.

REPORT.—*Weight*: 4 lb. 1½ oz.; ginned cotton, fairly soft, very lustrous, clean, and white to cream-coloured, with a few brown and yellow stains.

Strength: Generally rather weak.

Length of Fibres: 1.0 to 1.4 in.

Diameter of Fibres: 0.00055 to 0.00100 in., averaging 0.00073 in.

Microscopical Characters: A good many immature fibres were noticed.

Commercial Valuation.—11d. to 11¼d. per lb., with "good" Egyptian Abassi at 1s. 2½d. per lb.

Remarks: This sample was more silky than ordinary Abassi cotton from Egypt, and somewhat resembled "improved" American Upland cotton.

(*e*) Unginned cotton grown from *Egyptian Abassi* seed. From the same locality as Sample (*d*).

REPORT.—*Weight*: 4 lb. 3 oz.; unginned cotton.

Lint: Fairly soft, very lustrous, clean and white to cream-coloured, with a few brown and yellow stains. Yield on ginning, 32 per cent.; weight of lint per 100 seeds, 3.54 grains. The lint was easily detachable from the seed by hand.

Seed: Small and mostly smooth and dark brown, but a few pale brown smooth seeds were noticed, and also some seeds coated wholly or in part with a whitish down; 18 per cent. of the seeds examined were withered.

Strength: Generally rather weak.

Length of Fibres: 1.0 to 1.4 in.

Diameter of Fibres: From 0.0006 to 0.0009 in., average 0.00073 in.

Microscopical Characters: A good many immature fibres were noticed.

Commercial Valuation: 11d. to 11¼d. per lb., ginned, with "good" Egyptian Abassi at 1s. 2½d. per lb.

Remarks: The remarks on the preceding sample (*d*) apply also in this case.

The encouraging nature of this report is evident, and the very satisfactory prices quoted, especially for a sample grown under such adverse circumstances, demonstrate the practicability of cotton growing becoming a paying industry in this country, and should act as an additional stimulant to farmers to give this industry that serious consideration which it undoubtedly deserves.

Bee-keeping in South Africa.

By W. F. FULLER, Hon. Secretary, Natal Bee-keepers' Association.

THE importance of scientific apiculture is being slowly but surely recognized in South Africa. With a wider knowledge of the part bees play in the pollination of fruit blossom and the spread of rural education generally, bee-keeping cannot any longer be regarded as merely a hobby, but what it truly is—one of the most important of the minor branches of the science of agriculture.

Although conditions differ, the principles of bee-keeping are the same the whole world over, and the following axioms, given by Father Langstroth, the founder of scientific apiculture, should be carefully noted:—

1. Bees gorged with honey never volunteer an attack.

2. Bees may always be made peaceable by inducing them to accept liquid sweets.

3. Bees when frightened by smoke fill themselves with honey and lose all disposition to sting, unless they are hurt.

4. Bees dislike any quick movements about their hive, especially any motion which jars their combs.

5. In districts where forage is abundant only for a short period, the largest yield of honey will be secured by a very moderate increase of colonies.

6. A moderate increase of colonies in any one season will, in the long run, prove to be the easiest, safest, and cheapest mode of managing bees.

7. A queenless colony, unless supplied with a queen, will inevitably dwindle away or be destroyed by the wax moth or by robber bees.

8. The formation of new colonies should ordinarily be confined to the season when bees are accumulating honey, and if this or any other operation must be performed when forage is scarce the greatest precautions should be used to prevent robbing.

The essence of all profitable bee-keeping is contained in the one golden rule: "Keep your colonies strong." If you cannot succeed in doing this the more money you invest in bees the heavier will be your losses, while if your colonies are strong you will prove a *bee-master* as well as a bee-keeper, and may safely calculate on a generous return from your industrious subjects.

The Rosebank Show.

THE Rosebank Show of 1911 gave evidence of a very distinct and praiseworthy advance on the part of the Western Province Agricultural Society. Ever since its inception this society has been handicapped by its natural limitations. It has for years been holding its annual shows in very cramped conditions, and the struggle has been the more acute because of the extreme uncertainty of its tenure of the land occupied. These circumstances made it very difficult indeed for the society to expand its operations, or to embark on a policy of permanent development in the shape of substantial buildings for housing the exhibits; but these conditions fortunately have ceased to exist, and this year, for the first time, the show was held on a scale more suitable to its importance than has ever been the case in the past.

The Rosebank Showyard is, without doubt, the most beautifully situated ground of its character in South Africa—embowered in shady oak trees with the magnificent vista of the Devil's Peak and part of Table Mountain in the background, it is always a tempting spot to visit. Its natural attractions have now been enhanced by the opening up of further large spaces for show purposes, thus relieving the congestion which has been so marked hitherto. This has enabled the society to erect some very substantial permanent buildings; the first to attract the eye being an excellently designed brick structure which serves as a magnificent hall for the exhibits of fresh fruit and grapes, and at the same time provides perfect cover for the merino sheep pens below. This building stands on massive brick pillars, the whole of the lower space being left open for stock, while broad staircases on the outside lead to the first hall.

The next most marked improvement is a new building specially devoted to cattle. This is situated in the new paddock which has been added to the grounds, reached by a short walk through an avenue of oak trees. (A view of this building appears in the illustrations in this issue.) The extra space added also includes further accommodation for the judging and handling of horses.

There is still one improvement which might be considered with advantage. The peculiar conformation of the yard makes the immediate vicinity of the existing entrance gates very liable to congestion. This is accentuated by the fact that the space allotted to implements and machinery lies in the direct track of the crowds of visitors on the busy days. Would it not be possible for the society to make some arrangement for the main entrance to open into some side road instead of immediately on the main road with all the suburban traffic constantly passing? Some such scheme should help the working on the popular days very considerably.

Coming to the show itself, the society is to be congratulated on its all-round excellence. Even the machinery and implement section was better supported this year than on any previous occasion, though it has still a long way to go before it can equal the splendid exhibits in this section at some of the other Colonial shows.

Amongst the implements attracting attention were several types of light engines for various farm purposes, all working on the internal combustion principle. Of these there were a few specimens which exhibited more ingenuity in their construction and fitting than their ultimate efficiency would seem to justify. The latest improved Lawrence-Kennedy milking machine was shown at work and attracted much attention. What with our small milking herds and the cheapness of coloured labour, it is to be feared that it will be some time before a machine of this description will become popular in this country. There was the usual assortment of general farm machinery and implements, amongst them being the Weck sterilizer, a handy, useful, and effective method for preserving human foods of all kinds, which should prove of great value to our rural housewives.

The fresh fruit exhibits were excellent in practically every class, and it is to be regretted that the very opposite may be said of the dried fruit section. It is well known that most strenuous efforts are being put forward by western orchardists to establish a sound trade in Colonial dried fruits. It is also well known that they are meeting with a fair and encouraging amount of success; yet at a show like that of Rosebank where, practically speaking, the whole urban population of the Cape Peninsula may be expected to attend, the whole dried fruit industry of the Western Province was represented by but a few samples, and those not of the best. One would have thought that the exhibits in these classes would have been made the great feature of the show, if only to act as a most convincing advertisement to the town dweller of the excellence and cheapness of these South African products. Instead of that the bulk of the classes attracted one exhibit each. How such methods can ever be expected to establish an industry passes comprehension. On the other hand the fresh fruit classes were enthusiastically supported, the entries being numerous, the quality high, and the competition, as a consequence, very keen.

The general exhibits of stock may be described as of all-round excellence, but with the exception of merino sheep and angora goats they were essentially western in character.

In the horse classes there was a fair show of thoroughbreds, including "Commoner", "Barbuda", "Devil a Saint", and "Damocles", the latter being given the championship. The youngsters were also in fairly full strength. The hackneys were a strong class, but the Flemings, which used to form a most attractive group at one time, did not seem to be so well represented this year. The draught horses, heavy and light, with the saddle and harness horses of various types, made a brave show. The entries were very numerous in these classes and the competition of the best.

Wool, mohair, and ostrich feathers are seldom a very strong feature at Rosebank, and this year was no exception to the general rule; the quality, however, was quite good.

In the sheep and angora goat classes the entries were the most numerous ever seen on this ground. What is of more importance, however, is the fact that the quality was also quite good. The leading breeders of the Midland and Eastern Districts were very well represented, and as these include the great bulk of the better part of these two very important industries the results were more than satisfactory. In this issue photographs of the champions in the merino sheep section are reproduced.

One very interesting feature of the sheep section was the entries in the class for heavy breeds for slaughter purposes. Mr. H. Theunissen, of Durbanville, was the only competitor with both black-faced and whitefaced sheep, it is true, but even this is encouraging, as it shows that some of the western farmers are awakening to the possibilities in this direction which at present lie dormant. The production of regular supplies of sheep, specially raised for slaughter purposes, is an industry which must in the near future receive more attention with the continued expansion in the production of fodder which at present rules.

In the cattle section the Frieslanders (or " Dutch cattle " as they are now described in the catalogue) made a grand show, each class attracting splendid competition. This breed is so numerous that it has been found necessary, apparently, to split the section in halves—" heavy " types being shown as one class and the " light " types as another. How this new departure will work has yet to be ascertained. That there are two distinct types of these cattle in this country is very certain, and that it is difficult for them to compete in the same class is also well known. But so far as the departure here noted seemed to work it is not easy to see how it will overcome the admitted difficulty. The danger is that the " light " class will not attract the proper type of animal, and may be used to bring undesirable stock into undue prominence, and thus do harm instead of good.

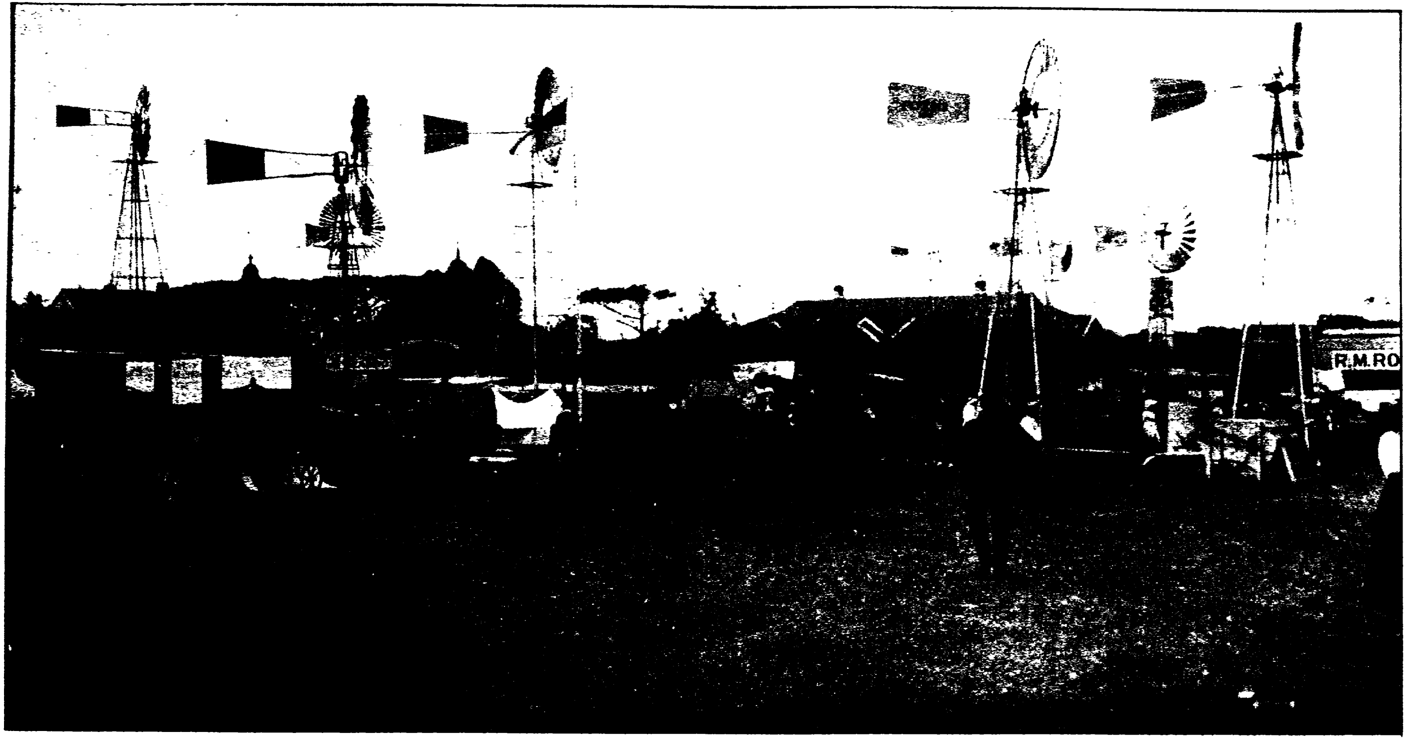
The Ayrshires formed another fine class, some animals of great merit competing. The one regret here is that we have not more breeders of this very useful family, and that although they are undoubtedly growing in popularity the number of the herds of any importance at all in this country is so limited. Jerseys were also well represented.

The show of poultry was good and deservedly attractive. In this connection it is worthy of note that this society's fourth egg-laying competition is announced. It is open to the whole of South Africa, and the entries close on the 15th of April.

Western Province Agricultural Show (Rosebank).

The New Cattle Byres, with the Mountain in the background.

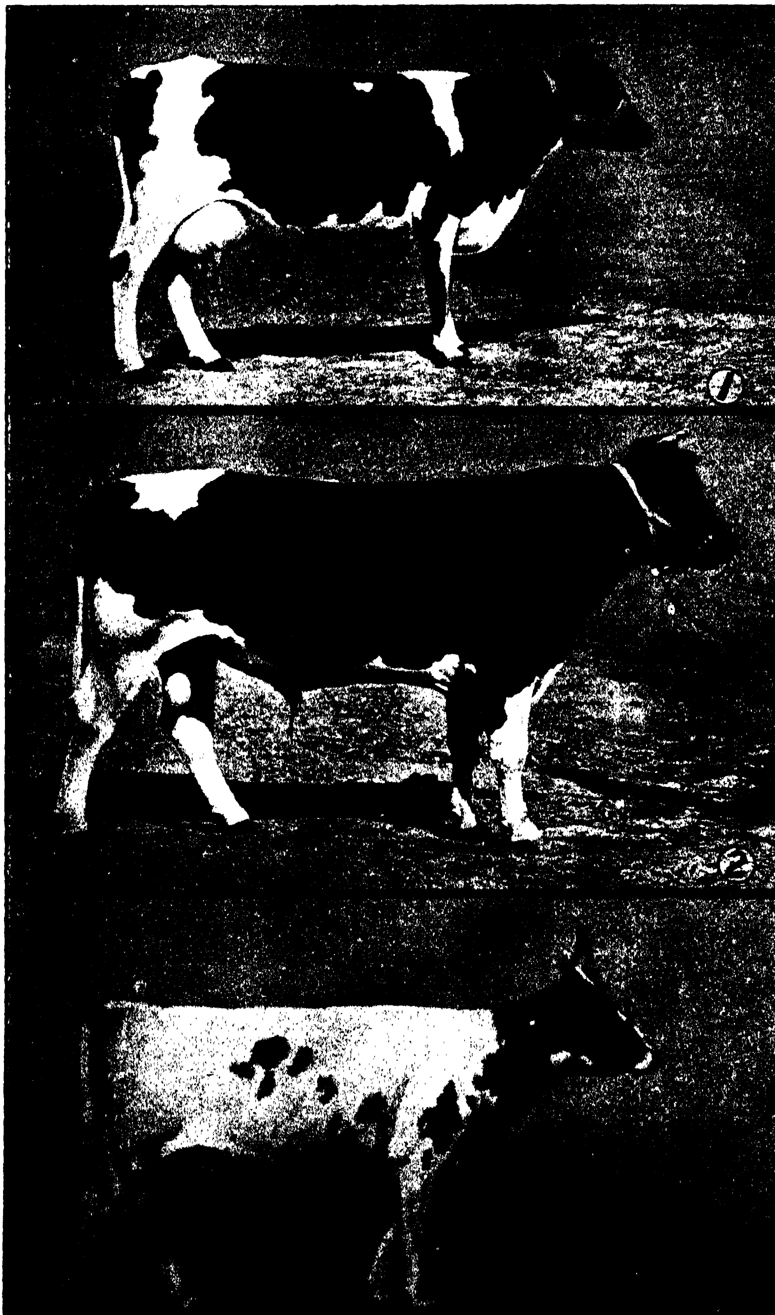
Western Province Agricultural Show (Rosebank).



Among the Implements and Machinery.

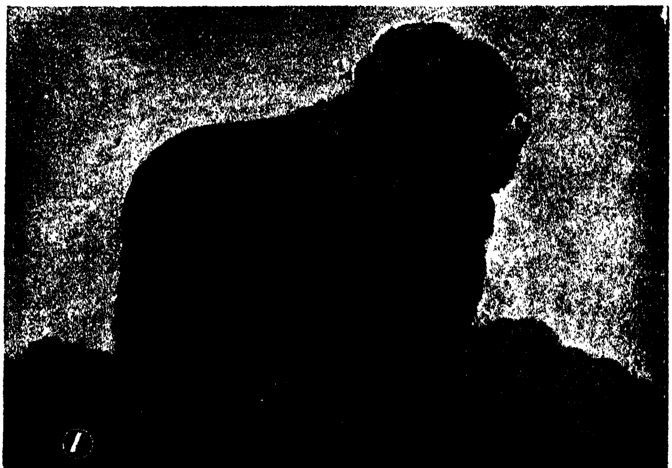
Some Champions at the 1911 Shows.

ROSEBANK CHAMPION CATTLE.



1. Champion (Heavy) Friesland Cow, the property of Mr. H. D. F. Nelson, Woodstock.
2. Champion (Heavy) Friesland Bull, the property of Messrs. Walters Bros., Malmesbury.
3. Champion (Light Breeds) Ayrshire Cow, the property of Mr. J. Rawbone, Sir Lowry's Pass.

Some Champions at the 1911 Shows.



1. Champion Ram (Fine Woolled) at Grahamstown and Port Elizabeth. Imported Tasmanian—"Silver King" by "Sylvian". Owned by T. T. Hoole, Atherstone, near Grahamstown.

2. Champion Ewe (Robust), Grahamstown. J. H. King, Highland Home, Tarkastad.

Some Champions at the 1911 Shows.

1. Champion Ram (Fine Woolled), Rosebank. Geo. King & Sons, Tarkastad.
2. Champion Ewe (Robust), Rosebank. J. H. King, Highland Home, Tarkastad.
3. Champion Ram (Robust), Rosebank. J. H. King, Highland Home, Tarkastad.

Some Champions at the 1911 Shows.

Champion Angora Ram, Albany Agricultural Show, Grahamstown. Bred and owned by J. E. Hobson, Shirlands, Graaff-Reinet.

Champion Ram (Robust Woolled), Albany Agricultural Show, Grahamstown. J. H. King, Highland Home, Tarkastad.

oth-bodied Von Homen Rambouillet Ram, exhibited at Rosebank, by the Smartt Syndicate. Live weight, 275 lb. This animal was placed second in the Plain-bodied Cla

Champion Ewe "Queenie" (Fine), Grahamstown and Rosebank.
C. Adams & Son, Glen Roy, Tarkastad.

Budding and Grafting of Fruit Trees.

By R. A. DAVIS, Government Horticulturist (Transvaal).

"THE ancients have taught us three kinds of ingraftments, one which, after the tree is cut and cloven, receives the scions that are inserted into it; a second which, after the tree is cut, admits the grafts between the bark and the wood, both which kinds are proper for the spring season; the third, which the husbandman calls 'emplastration', receives the buds themselves, with a little bark, into a part of itself from which the bark is pulled off; this kind is proper for the summer.

"When we come to explain the method of performing these ingraftments we shall also teach you another invented by us."

The above words were written by "Columella", a celebrated Roman authority on all matters connected with agriculture, horticulture, and viticulture, in or about the year A.D. 55. They point unmistakably to the extreme antiquity of the practice of budding and grafting.

It is impossible to state the origin of these operations of the fruit grower; Columella himself refers to the ancients as having taught them.

Both budding and grafting are employed as means by which one variety of tree may be altered or "worked over" to another. The reason why such alteration should be necessary is in some cases that a non-productive tree may by this means be made to bear fruit. In others, that certain roots or stocks being more suitable for particular soils, such may be utilized as graft bearers. Again, budding and grafting are both used as a means of rapid propagation of certain favourite kinds of fruit which would not come true from seed, or which from some reason or other are not in fashion, for fashion changes in fruit trees as in other things; witness the present demand for Japanese plums and peaches of the Chinese strains.

A further use is to modify or encourage the growth of some kinds of fruit, as on the one hand in the case of pears grafted on quince stocks, the result is generally the production of a dwarf tree, so on the other, the working of many kinds of plums on peach stocks ensures a large tree of rapid and strong growth. Further instances might be multiplied.

The use of the "Northern Spy" as an apple stock is a prominent illustration of the use of budding. Whilst most apple seedlings are highly subject to the attacks of American blight (*Schizoneura lanigera*) and thus have proved of little use as graft carriers, the kind named and some few others have roots absolutely resistant to this pest and are consequently universally adopted as stock on which to bud other varieties of apples. In the case of grape vines, it is well known how in different countries the wine-making industry has been almost ruined by the appearance of Phylloxera amongst the vineyards. By the use of American varieties and their hybrids, which have been proved resistant to the attacks of this insect, the trouble has been overcome and wine growing placed again on a satisfactory basis as

regards production. In order to utilize these stocks which are non-bearing or produce only unacceptable fruit in most instances, resort is had to grafting. This is perhaps the most striking instance on record of how great importance such a simple operation can become.

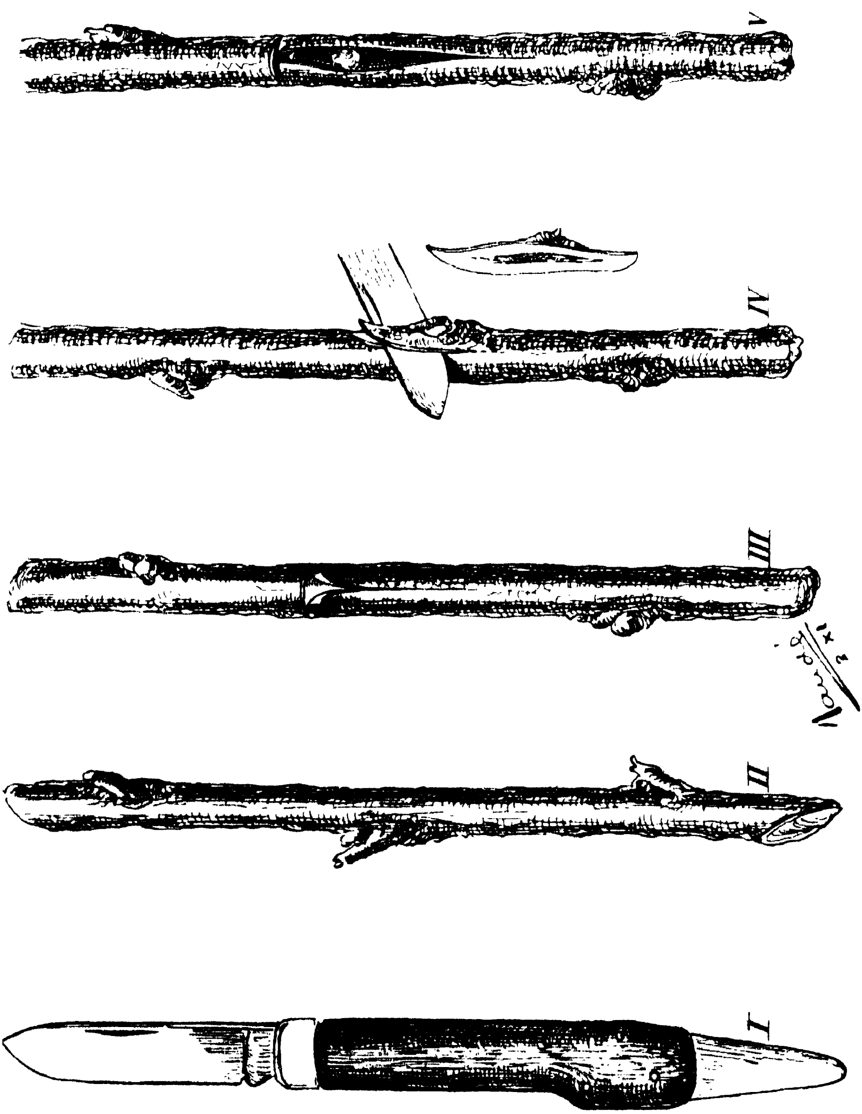
In order to approach the practical side of the question with some degree of system it would be as well to divide it under separate headings. Firstly, the methods adopted for propagating fruit trees in the nursery. It is taken for granted that all lands set aside for nursery purposes will have been either ploughed deeply or trenched at least "two spits" deep, the soil manured, if necessary, and reduced to a fine state of tilth, free from large unbroken lumps, and made, as it is called, as "mellow" as possible. The seed should be planted in rows 4 feet apart and 6 inches distant in the row in July or August, according to the locality, and if a good start is made the young trees should be in condition for budding by about February or March following. This operation of itself is one of the simplest and consists in the removal of a "bud" from the tree which it is desired to propagate from, and its insertion within a slit made in the bark of the seedling in such a way that the exposed cut surface, showing the inner bark of the bud, should come in direct contact with the growing wood of the stock. The cut bark must then be wrapped with some material in order to ensure the desired union and to prevent the drying out of the bud, which will happen if this work is not done.

It is customary for a budder at the commencement of his work to secure a number of cuttings of the varieties needed for propagation and defoliate them.

The bud sticks, as they are called, should be kept fresh and moist by wrapping in a damp cloth. Figure I represents a proper budding knife, without which it is not wise to commence operations, and it may be noted here that this knife must be kept as sharp as possible. The blade is used for making the T shaped cut needed, and the ivory haft is for opening up the bark if it does not "slip" easily.

Figure II shows a bud stick, as carried by the budder, ready for use.

The work of budding is commenced by the operator, who is armed with all necessary materials, taking the seedling in hand and making an incision lengthwise down the wood through the bark at a spot some 5 inches above the ground. Then he makes a horizontal cut across it towards the top of the first cut with the blade of the knife held slightly downwards. In withdrawing the blade a slight turn outwards leaves the top of the first cut open and ready to receive the bud (figure III). If not sufficiently open he takes the thin end of his knife handle and lifts the bark at the top sufficiently to admit the bud easily. Next he takes a bud, cut as shown in figure IV, from the back part frontwards, inserts the point into the opening made for its reception, and gently pushes it down until it attains the position shown in figure V. The last point is to securely tie the bud in its place. This should be done so as to keep out all air, and with sufficient pressure to keep the bud close up to the growing woody part of the stock, but not sufficient to cut into the bark (figure VI). Some ten days after the work is finished the ligatures should be looked over and, when necessary, loosened, as the growth of the stock will occasionally cause the material used to cut into the bark, thus displacing the buds and rendering the work futile. The material generally used for tying in buds by nurserymen is "raffia grass", which is inexpensive and thoroughly answers the purpose. Strips of calico, tape, etc., may also be used, in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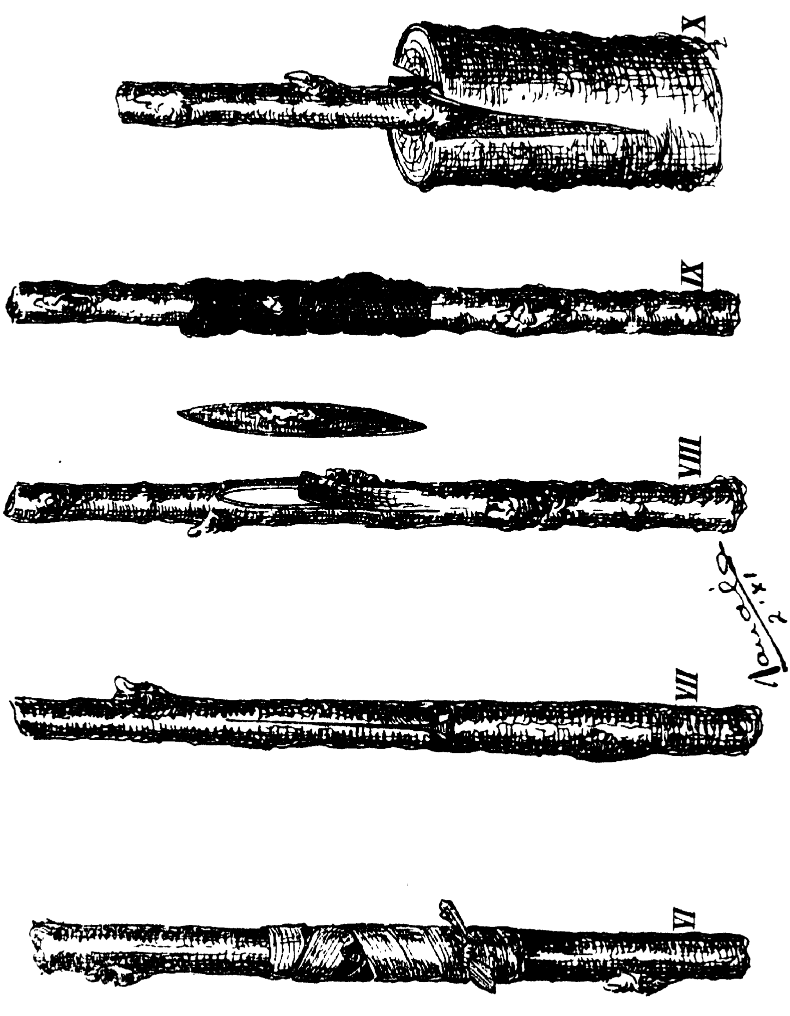
X
IX
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VI

fact, anything in the way of strips of bark or fibre which will stand the necessary pulling. String is sometimes resorted to, but this is not advised on account of its tendency to cut into the bark.

Figure VII represents the first cuts of practically the same bud, with the exception that it is inverted in order to admit of the bud being pushed upwards instead of downwards. This change in the manner of working is necessitated by the fact that too much moisture is likely to gather round the tying material during our wet weather, and if it penetrates into the cut decay is frequently set up, especially in working such trees as orange, lemon, and naartje, and so it is that the custom of "budding up" is more particularly regarded as being necessary for the working of all kinds of trees of the citrus family.

Possibly nine-tenths of all the nursery stock sold in South Africa is produced by the use of one or other of the above methods of budding. They represent the "emplastration" spoken of at the head of this treatise. The third kind of budding it is proposed to illustrate is of more recent introduction, and has so far had comparatively few adherents. It is shown here as being equally as adaptable and simple as the older methods. The requirements are again the budding knife and raffia grass for tying.

Figure VIII shows the growing stock with bark partially removed and cut for the reception of the bud; IX, the bud inserted; the tying is precisely similar to that used in the previous method. It will be seen that the bud is cut in this instance with a little longer shield than that previously shown, the bottom of the shield fits in the slit in the lower half of the stock between the bark and the stock itself, whilst the upper half of the shield covers almost exactly the space left without bark. This bud has proved very satisfactory on some of the nurseries on the Government Experiment Stations, and can be made use of when it is too late or too early in the season for the bark to slip easily.

Grafting of nursery stock, at one time universal, has now been almost entirely superseded by budding, the latter method being equally satisfactory and by far more rapid in actual practice. Grafting of such stocks is briefly described in case that method should appeal to any local readers. Seedlings to be grafted must complete at least the first year's growth from the pit, and if not then sufficiently large may be left for another year.

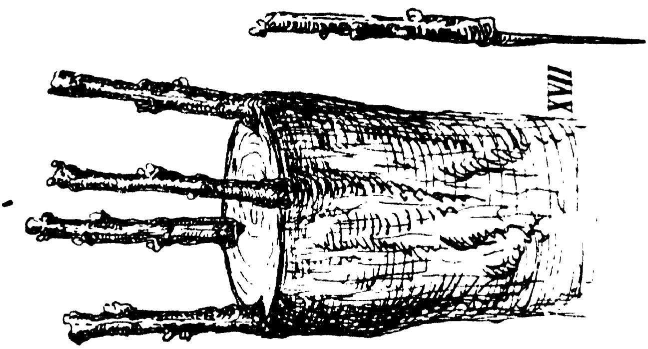
Grafting must be done as late in the winter as possible, and may be performed either in the nursery rows in which the seedlings have been planted, or the stocks may be taken out and worked in an outhouse, or in any convenient place. The procedure as to the actual operation is in either case the same, and it may be stated that there is little need of removing the stocks in this country, so that the grafting in nursery rows only will be touched upon.

The kind of graft to be used will depend largely on the size of the stock to be worked. If they are irregular as to size and measure, from ½ to 1 inch in diameter, the cleft graft is to be preferred, as shown in figure X. When the stocks are smaller and of a size somewhat approximating that of the scions the whip graft may be used (figure XI).

In either case the stock is cut off a little above the crown of the roots, and as this spot is usually below the surface of the ground the soil may be removed along each row, exposing the crown roots before the work begins. Usually scions are inserted with three or four buds tied with raffia, which together with the tip of the scion is then painted

XIII

XII



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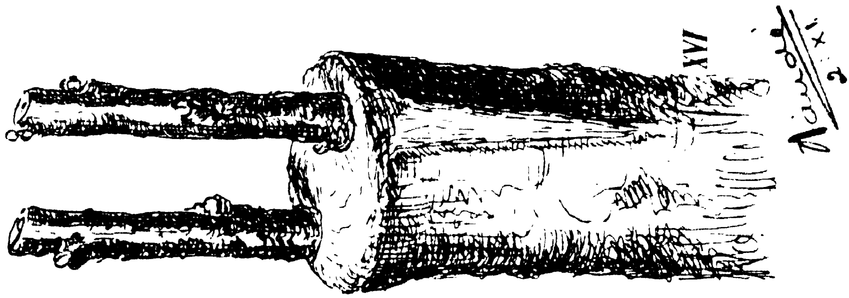

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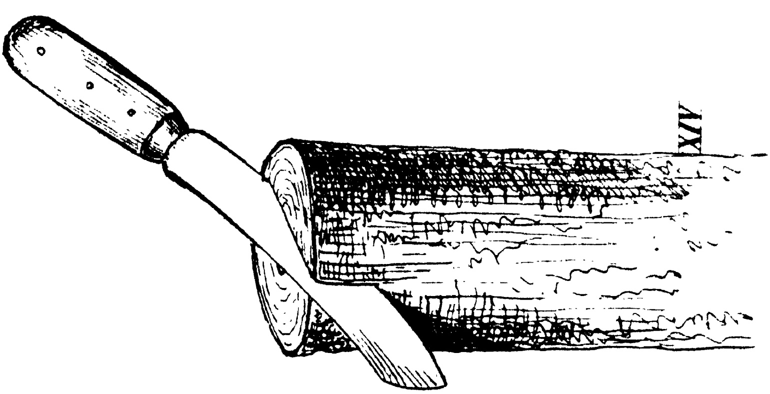

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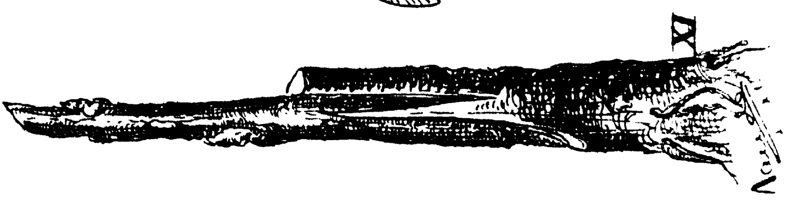


XV

over with warm wax and the earth brought back along the whole row, just high enough to allow the two top buds to remain exposed.

The methods which have been detailed cover the ground as far as all ordinary nursery work is concerned. It is sometimes necessary, however, to resort to what is known as double working. When, for instance, a plum of a certain kind will not take readily to peach stock, it is customary to bud the latter first of all with some kind of plum which has an affinity for the peach, and after allowing a year's growth to bud on this, the particular kind of plum it is desired to propagate.

As this process is somewhat tedious and of course expensive it is not often resorted to.

Again in working blight proof apples it has been found desirable for the sake of extra resistance to bud spy on spy and to rework again for the variety required. By some growers the whip graft is used at a distance of a foot from the ground, and it is claimed that this affords further protection in that it places the susceptible non-resistant variety at a greater distance from the ground.

The working over of old trees occupies the second part of this paper. It is especially useful and has frequently to be resorted to in the Transvaal where, owing to insufficient knowledge of the right kinds to plant, many mistakes have been made in varieties. Recourse to grafting enables these to be changed over to good bearing kinds without the loss of more than two years' crop; in fact, so well do the grafts grow in many instances that they often bear a heavy crop in their second year.

The first method mentioned by Columella is that most favoured to-day. In figure XII a tree is shown which it is proposed to graft; in figure XIII the top is removed, leaving the stubs in which the scions are to be placed; the length of the stub is regulated somewhat by the size and shape of the tree, but from 12 to 18 inches is usual.

Figure XIV shows the method of splitting the stock. A good deal of judgment is required to regulate the depth to which it should be split; if too long the grip of the split sections is apt to be a little loose, thus making it possible for the scion to get out of position, whilst if too shallow a split is made, the grip becomes too tight and the transmittal of the sap from stock to scion is impeded. As with most other things success in this work is gained by practice, but a novice can master the art of splitting stock to just the right spot in the course of a few lessons. Care should be taken that the splits are not made immediately through the centre of the stem; they should be in all cases somewhat to the side of it. As many as four scions may be placed in a large branch, and in such cases the splits are made parallel to each other. Usually in a branch 2 inches in diameter, two scions are sufficient, larger ones require more.

Figure XV shows the scion cut ready for insertion into the cleft. It is always customary to cut this so that one side of the scion is a little thicker than the other in order to enable the union of the bark of both tree and scion to be effected more readily, and also because if the wedge had both sides equal in thickness the outer edge of the scion could not of course come into contact with the bark of the stock, and thus the grafting would be ineffective. In what may be described as a perfect graft, the inner bark of the scion should be in direct contact with the inner bark of the stock throughout its entire length. In actual practice this rarely occurs, nor is it absolutely necessary, because it has been found that a satisfactory union can be made if only

a portion of the bark of the scion and that of the stock come into contact with each other, and for this reason it is customary to set the scion pointing a little outwards at the top and consequently a little inwards at the bottom. When this is done it follows that at some point the bark of the scion and that of the stock intersect one another, and it is from this spot that the act of union proceeds. When the scion points outwards very slightly there is a greater surface of the barks in contact than when an extreme angle is formed, and this should be borne in mind, as the greater the contact surface the better chance there is of a good union.

Figure XVI shows the grafts placed in the stock and waxed over. The actual putting of the grafts in their places in the cleft must be carefully done, and the cleft may be held sufficiently open for their insertion by means of a small chisel or piece of iron used as a lever. Sometimes, when any danger is feared owing to clefts being too shallow, it is customary to drive in the centre of the cleft a small wedge of wood and to allow it to remain there, thus ensuring the impossibility of undue pressure. After the grafts are in place comes the waxing process which is necessary in order to exclude any air which might find its way into the graft. If this should occur the graft will die. For the purpose of waxing a good grafting wax is needed, and the following is about the best for general use, 6 lb. resin, ½ lb. beeswax, 1 oz. raw linseed oil.

These ingredients must be placed in a pot or iron vessel and allowed to melt together over a slow fire. They should be stirred occasionally, and the mixture should not be allowed to boil, because this would cause air bubbles to form, and these are objectionable. The wax should be applied hot, and it is well to use an ordinary paint brush for the purpose; the whole of the top of the stock must be covered, also the splits at each side and the tips of the scions. One cannot be too particular in this work; a spot frequently overlooked is the little corner between the inner side of the scion at its junction with the stock.

Another method of grafting over old trees is as follows:—The branches are removed as previously described, leaving the stubs to be operated upon. Scions are then cut and inserted beneath the bark in the manner shown in figure XVII. The same waxing process follows.

Besides the methods of budding and grafting described there are others which might be mentioned, but those already alluded to are the best and in most general use.

Time for grafting.—This operation is best undertaken in the Transvaal just before the blossoms open, but it is fully as successful even when the trees are in full bloom, provided that the scions are dormant. No particular date can be mentioned as our climates vary so much, but it may be said that from the beginning of July to the middle of August is a generally suitable period—the latter date applies to the high veld and the former to the warmer parts of the country. Scions can be kept in cold storage to ensure their dormancy, or when this is not obtainable, they may be buried a foot deep or less in some cool, moist (but not wet) earth. This is mentioned because scions are usually collected at pruning time, which may be a month or two previous to grafting.

Budding is usually done by nurserymen just previous to the fall of the sap, and may take place in February or March according to the locality and condition of stocks. Such buds are called dormant buds, because they are supposed to remain dormant until the following

spring. These undoubtedly make the best trees, but spring budding can also be successfully done. In this case the buds are inserted with the rise of the sap in August and September. It must be noted that the buds must be kept dormant, and this can only be done by the adoption of one of the above-mentioned methods.

In grafting over old trees one has to recollect that the removal of the protecting head leaves the trunk and branches which remain exposed to the full heat of the sun, which in a climate such as ours is sometimes intense.

It is well, therefore, to whitewash the whole of the trunk and branches in order to prevent injury from what is called " sun scald ". Another method of attaining this end is the leaving of one branch in such a position as to shade the mutilated portions as much as possible; this branch can be entirely removed or grafted over the following year. It is claimed also by some that this method provides a channel to carry off the surplus flow of the sap, which with the removal of the entire top of the tree may be considerable. The writer has, however, always found, if plenty of scions are put in, that there is little danger of any injury to the tree from this source. When the grafts are well under weigh and have grown out to a couple of feet or more in length they should be cut back to about 15 or 18 inches in length; this has the effect of strengthening them and preventing any danger of their being blown out by high winds.

It will be noticed that the various methods described in this pamphlet coincide practically with those mentioned in the quotation at its beginning—after 1900 years the same practices are still in use. The question of working over citrus trees will be dealt with separately.

Sheep in South Africa.

By J. F. McNAB, Wool Expert, Orange Free State.

ORIGINAL SHEEP OF SOUTH AFRICA.

PRIOR to the introduction of woolled sheep into South Africa, there were several varieties of native sheep roaming over the country. These varieties were all more or less of one species (though of varied colours and with pelts covered with different kinds of hair). They had tails of tremendous size, hence they became commonly known as the fat-tailed sheep of South Africa. These sheep, though with covering of no commercial value, had flesh of good quality, hence were often used for mutton.

HISTORY AND INTRODUCTION OF MERINOS.

There are at present a great number of breeds of merino sheep of established type, but all can originally trace their descent to the sheep of Spain, of which there were no fewer than ten varieties, though practically all were of one sort. Some authorities even go so far as to trace our merino sheep through Spain to Carthage, then to Italy and Greece, to the early native sheep of Asia, but as we have no authenticated history of the merino sheep prior to their abode in Spain, we will take that part as their original home. The word merino is derived from the Spanish variety "transhumantes", signifying travelling, though it is stated that the word may be also derived from "Marinas", a Roman officer, who brought sheep over to Spain. From Spain this breed of sheep has been exported to almost all parts of the world. The United Kingdom was the first to import, getting 3000 across from Spain as early as in the reign of Edward V., followed about one hundred years later with a second importation of about the same number.

In 1765 an importation of merinos from Spain was made into Saxony.

Other nations, Austria, France, etc., soon followed with other importations from Spain to improve the native breeds then existing on their boundaries.

That which is of particular interest to us, was the first importation of merinos into South Africa.

The first consignment was brought in by the Dutch from Spain in 1754, which unluckily was attended with poor results. A Mr. Ritter imported another shipment to the Cape in 1790. It is reported that it was the progeny of this latter importation that were exported to Australia in 1797 and helped to found that vast industry of sheep-raising at present carried on to such an extent in that island continent. The merino sheep thus introduced to the Cape have since

then increased to a very great extent owing to the suitability of our climate and of our pastures to the breed.

GENERAL CHARACTERISTICS.

The merino is essentially a woolled sheep, producing as it does the highest class of fine wool procurable, and wool which is suitable for the production of the very best cloths. It is a hardy sheep, capable of travelling for long distances in search of food. It is not very large in frame, and therefore can subsist on very little fodder in case of droughts. It does best on hilly country where it is not too wet under foot.

FINE WOOL *versus* MUTTON.

Though merino sheep are generally known as fine woolled, they have now been bred with strong wool to suit certain conditions. We will, however, take the merino generally as fine woolled. The principal factor in the cultivation of the merino sheep is the production of wool, and it may, at the same time, be increased highly in value by producing also carcass. Though not considered a mutton breed, it is for dual purposes much more profitable, as along with a fair carcass you receive high value per head for wool from good quality merinos. I am of course speaking at present from a South African standpoint, where the longwools (mutton breeds), such as the Lincoln, Leicester, Shropshire, Southdown, Romney Marsh, and many others too numerous to mention, do not do well, as their fleeces become so light and their progeny stunted. These mutton breeds require rich pasture, or otherwise must be fed with mangels, oats, etc., to give good results, and the average sheep farmer of South Africa has not these feeds at his disposal in large quantities. The height of elevation in the Free State and severity of winter months also tend to affect their growth.

As the merino breed does so well here it easily comes off as victor against all other mutton breeds.

CARE AND MANAGEMENT.

Now having decided that the merino is the most profitable animal, we come to that most important point "care and management". Many breeders who possess good quality animals entirely overlook this most necessary adjunct.

Three things are essential to become a successful breeder. They are "breed, weed, and feed". Not the least important of these is the last mentioned, as without sufficient nourishment even the best young animal will become stunted, and turn out disappointing to the owner.

Many of the authorities say that a "lot of the breed goes in at the mouth", meaning that a bad animal will look well when fat, and a very good one may look badly if not well fed. Therefore it behoves us to first prepare a plentiful supply of fodder for the flock throughout the winter and early spring months, and to keep them in a healthy condition. Not only is the animal improved, but it clips

a heavier weight of wool of a sound quality which more than pays for the production and feeding of the fodder.

You may here put the question: But with what must we feed? This depends entirely on the season and on your farm. The most general, and which practically always grows, is mealies. These may be fed either as grain scattered on the veld, say, to begin on the 1st of June, at a ration of 1 lb. to every ten sheep, increasing the ration as the winter advances—this will not only keep the sheep in good condition, but they will also fatten if the ration be liberally increased—or the mealies may be cut with the cob whilst the grain is still soft and turned into ensilage. Sheep get very fond of mealie ensilage, and any thick stalks left by them could be fed later to cattle, who will devour them greedily. There are many other feeds—winter oats, turnips, rape, mangels, or even the veld grass, if cut in time and stacked. This latter, if fed with a ration of mealie grain, fattens quickly. Should it be desirable to exhibit a sheep on a show, then mealies should not be fed in any quantity, as they are too heating and colour the wool. The best feed for show sheep is mangels, oats, and bran. These feeds keep the wool bright and in good show condition. I might here mention that in the southern and parts of the western areas Karroo veld provides excellent winter feed. Mealies are not easily grown in quantity in these parts, but a little lucerne under water, or even winter oats or wheat, will be found a good standby for sheep and lambs in the winter months. However, the veld in a good year keeps green throughout the severe period.

BREEDING.

With careful and judicious selection it is surprising how soon a flock of inferior sheep can be bred to a good standard. We must bear in mind that climate and pasture play the most important part in determining a type, hence we must first consider our environments. Climate has much more effect upon sheep and their covering than is generally understood.

Sheep above all other animals are the most susceptible to improvement.

CLASSING AND MATING.

Much attention is necessary when selecting rams, whether for the stud or for use in the ordinary flock. Many of our sheep breeders consider that the improvement of a flock rests entirely with the sire. Though the sire is mainly responsible for the improvement, he is not wholly so, as the dams also play an important part and should be specially selected. If a breeder possesses intimate knowledge of breeding he will by carefully choosing the animals gradually remove undesirable qualities and strengthen those most desirable.

The result of breeding depends principally on the skill exhibited when mating the animals to be made use of for this purpose. Mistakes will surely lead to failure. A stud master will consider his ewes first, selecting those of an even type. He will then select his

ram with a view to improving the progeny by reducing existing faults and improving the symmetry and covering. In any particular breed there is a standard of excellence which all parents should possess in proportion to their type. The sire must show a pronounced ram-like appearance, whilst the dam should be strong, though refined looking. Head should be well set and broad, but not too large; wide, deep, and roomy chest; back strong and straight, legs well set and stout. Ribs well sprung, quarters long. Bones should not be coarse, neither should the neck be thin. The latter is a very bad sign.

The wool on either sex should be of a robust growth with a free true character. Avoid a ram with very pretty wool or with a rough straight fibre. One other item of serious consequence is a short or long jaw. Discard any animal showing either. Root feeding when young sometimes draws out the lower jaw. This must not be confounded with a naturally long lower jaw. The former does not lower the value of a sire, whilst the latter does. Then there is the devil's grip. Any animal having this fault should be shunned as though he had the bubonic plague. It consists of a malformation on and behind the shoulders, sometimes extending far down the side. This fault is most easily transmitted to the progeny.

Classing sheep is most important, throwing out the weeds (which are comprised of weak constitution animals, stringy, loose woolled, short stapled, and straight fibred wools). Even Virgil in his early writing, in speaking of the breeding of sheep, specially advised culling the flock.

USE AND MANUFACTURE OF WOOLS.

No other classes of wool are used to the same extent as merino wools for the manufacture of the strongest and the most expensive fabrics. There is a beautiful class of merino wool produced in Silesia and in the Mudgee District, New South Wales, which on account of its fineness and kindness in handling is used extensively in silk factories, where it blends most readily with the true silk. A great deal may be said about the various manufactures of wool, but the space at my disposal does not admit of our going more fully into the subject.

WOOL SORTING AND CLASSING.

More attention should be paid to the get-up of wools than is generally the case. One must of course first breed a good class of wool, then give it special attention in the get-up. The get-up goes a long way towards getting a high price where a clip of good quality is being handled. The sheep should be first carefully shorn on a clean floor, after which the fleece should be thrown on a wool-table with the flesh side of the wool underneath. The table should have strips of wood nailed crossways on top, such strips to be 1½ inches wide and with a space of 1¼ inches between each. These spaces let the dust and second cuts fall through to the ground. The dirty edges should then be carefully torn off the fleece. In rolling the fleece turn in one side a couple of inches, then fold over the opposite side almost so

far that the two edges will be level, then fold again from the same side, which will leave the back on top. When rolled the back will be inside the fleece. Roll from the tail end until a little more than halfway, then roll from the neck end. The fleece should not be more than from 10 to 14 inches in width, and should be rolled neatly. Where clips are so small it is not necessary to make many sorts, a couple in fleece being quite sufficient. The bellies should be packed by themselves. Should there be no grass seed, very few pieces need be taken off; such may be packed separately or placed with the locks. Bales should not be filled to weigh heavier than 360 lb.

Classing of wool in this country needs little attention as the clips are too small. In Australia handling big lots gives an opportunity for classing. It is, however, advisable to put very heavy-conditioned, unsound, or short-stapled fleeces in a second class, the first to contain all bright, shafty, light-conditioned wools of good length and soundness.

The best wool is always produced on the shoulder and down to the forearm of the sheep, being bright and of better length there as a general rule. The wool from the britch is usually of lower quality, as also is the belly wool. In judging wool several points need to be looked to: Length, soundness, actual yield, kindness in handling, quality, elasticity and pliability, trueness of crimp and fibre; actual yield, length, soundness, and quality being four of the most important. The Orange Free State is admirably adapted to the production of a high-class wool, so that with attention to breeding and quality we may expect great improvement in our wool industry in the near future, so that I can do no better than again to advise you to give attention to those three words, "*breed*, *weed*, and *feed*".

Catalonian Jacks and Jennies.

APPLICATIONS FOR PURCHASE BY GOVERNMENT ON BEHALF OF FARMERS.

APPLICATIONS (in the subjoined form) addressed to the local resident magistrate are invited from bona fide farmers residing within the Union for the purchase by the Government on their behalf of Catalonian Jacks and Jennies to be selected in Spain by Mr. J. D. Borthwick, formerly Chief Veterinary Surgeon of Cape Colony, and now Assistant Principal Veterinary Surgeon (Acting), Cape.

The following are the conditions on which the purchase will be made:—

1. The applicant must deposit with the resident magistrate a sum of £175 for each animal within two weeks of acceptance of his application, and before the agreement referred to in the next following condition is entered into. Any excess of the deposit money over the expenses of purchase will be refunded.

2. A written agreement (cost of which must be borne by the applicant), supported by one or two sureties acceptable to the Government, must be entered into in which the applicant undertakes

   (*a*) not to dispose of the animal or animals for a period of twelve months from the date of their arrival in South Africa;

   (*b*) to take delivery of the animal or animals at a railway station to be named by him on a date to be fixed by the Government;

   (*c*) to pay all expenses incurred in the purchase up to the time of delivery at the said railway station, including the pro rata share of the expenses of the officer detailed to effect the purchase, freight, insurance, rail charges, and other expenses;

   (*d*) not to hold the Government responsible for any loss by death of the animal or animals or otherwise which the applicant may sustain or for failure from unforeseen or other cause to meet either wholly or in part any accepted application;

   (*e*) to accept the animal or animals which may be delivered to him without the right of refusal in the event of the animal or animals not meeting with his approval;

and in which the surety or sureties undertake to forfeit a sum of £25 for each animal in the event of stipulation (*a*) above not being adhered to by the applicant and to pay the excess, if any, of the expenses mentioned in (*c*) over the amount deposited by the applicant, in the event of the latter failing to effect such payment within two months of the delivery of the animal or animals.

3. Applications must reach the Department of Agriculture, Pretoria (through resident magistrates), on or before the 30th April, 1911.

4. The Government reserves the right not to carry out this proposal if applications for the purchase of less than twenty animals are received by the date mentioned in the preceding condition.

5. It may be found that few or no jennies are procurable or that sufficient suitable animals cannot be obtained to comply with all the applications, in which event the Government reserves the right to meet applications in the order in which they are received at the Department of Agriculture, Pretoria, or to supply any applicant with less than he applied for, provided that all applicants for jacks shall be supplied to the extent of one each, if possible.

6. The Government also reserves the right to refuse to entertain any applications.

FORM OF APPLICATION.

The Resident Magistrate,

SIR,

I have the honour to request that the Government will cause to be purchased on my behalf in accordance with Government Notice No....... of ......April, 1911,.............jacks and .... jennies.

I carry on farming operations at..............in the District of.................., and hereby accept the conditions mentioned in the said Government Notice.

I shall deposit with the Resident Magistrate of.............. the sum of £.......... immediately I hear that this application is accepted. I propose as my sureties Mr......................... of..........................and Mr......................... of......................whose written acceptance of the responsibilities mentioned in condition (2) is herewith enclosed.

(Signature.)

(Place)............................

(Date)............................

NOTE.—The resident magistrate is requested to forward this application only when he is prepared to recommend that the sureties proposed be approved, and he should then endorse the application to that effect. He should also express his opinion as to the bona fides of the applicant.

F. B. SMITH,
Acting Secretary for Agriculture.

Union of South Africa,
Department of Agriculture,
4th April, 1911.

4

Cream Ripening.

By R. PAPE, Superintendent of Dairying.

MILK fat is present in the milk in the shape of minute drops, and when you make butter all these droplets must be collected and changed from the liquid to the solid state. A first step in this direction is to divide the milk into "cream" and "skim milk". About 90 per cent. of the milk fat is then concentrated in a liquid which is considerably richer in fat than the original milk. A second step is the chilling of the cream to just under 40° F., which will cause part of the fat to solidify. Care should be taken not to freeze the cream, as refrigeration till under the freezing point has an adverse influence on the quality of the butter prepared from such cream. The danger of over-chilling is not great, however, for to the technical difficulties experienced in obtaining such a low temperature must be added the active opposition of the cream itself. If cream be chilled to under 40° F. a rise in temperature will follow on account of the "self-heating" of cream. When fat solidifies heat is liberated, and this causes a rise in the temperature of the cream.

Fresh, well-chilled cream, kept for a few hours at a low temperature, could be heated up to churning temperature and churned. Some creameries have adopted this system, but they have to contend with two objections:—

1. Butter churned from fresh cream is lacking in flavour, and the public generally require more aromatic butter.

2. The butter yield is too small, i.e. too much butter fat remains in the buttermilk. To obviate these difficulties the cream should be "ripened", be brought into such a condition that less fat remains in the buttermilk, and the butter is more aromatic. The "ripening" of cream is often referred to with the ill-chosen term "souring", and this term is really misleading. Two processes should be carefully distinguished. (*a*) Physical changes in the cream resulting in facilitating churning, in consequence of which more fat will be recovered as butter and less fat will remain in the buttermilk. (*b*) Development of flavour. Both processes are based on the activity of bacteria, but the species causing both changes are different.

The physical changes in the cream are caused by the petonizing bacteria which change the cream into a slimy mass. The souring is chiefly caused by the ordinary lactic acid bacteria, assisted or otherwise by the specific aromatic germs. Now the problem to be solved is to guide both processes in such a way that they reach the desired point simultaneously, and that the one process does not run quicker than the other.

The two processes are more or less opposed to each other. If the souring is very rapid then the lactic acid will commence to precipitate casein, and once the casein has been precipitated it escapes the specific action of the peptonizing bacteria. If the ripening is too rapid and the souring too slow, then a good butter yield will result, and little fat left in the buttermilk, but the butter will be lacking in flavour.

The consistency of properly ripened cream can best be described as follows:—If a stick is dipped into the cream and withdrawn, the cream should not fall from the stick in drops but in threads; you must not hear the falling of the cream. Drops of fresh cream you hear falling with a sharp rapping sound, and this sound should have disappeared. An old-fashioned but practical test for the ripeness of cream is to put into it a flat stick about three feet long and one inch wide. Insert vertically to a depth of about eighteen inches and let go. If the cream is "ripe" the stick will remain standing, if not the stick will topple.

For judging the acidity of the cream the only reliable instrument is the acidimeter. You cannot rely on taste for the tests, for the taste of various individuals will differ; further, the cream may contain different varieties of lactic acid, and these, again, also differ in taste. Certain varieties of lactic acid have a pleasant taste, others sharp and unpleasant. If an agreeably tasting acid has been developed, the acidity is frequently under-estimated in tasting; with an unpleasantly tasting lactic acid the acidity is often over-estimated.

If the object is to make butter that has to keep a fairly long time, but shows some flavour, an acidity of 50 to 60 Dornic should be developed. If you want to make highly aromatic butter for rapid consumption (such butter soon begins to decay), then an acidity of over 90 or 100 Dornic is developed. In practice you can say that flavour and keeping qualities of butter are inversely proportionate—the more flavour the less keeping quality.

If butter-making is not carried on in a haphazard style, but with a definite end in view, then the cream should be carefully ripened, and this wants narrow supervision. A first requirement is that the tempering of the cream should be easy. In South Africa the temperature differences during twenty-four hours are very considerable. Many a time I have observed differences between maximum and minimum of 36° F. and more. As the ripening of cream takes the better part of twenty-four hours, its temperature has a tendency to vary considerably, and changes in the temperature cause changes in the bacterial flora. Considerable changes cause an irregular ripening, and the result will be an irregular quality of butter.

Fig. 1 shows a simple contrivance which makes it possible to equalize the temperature of cream. It consists of a tank of wood, stone, or metal in which the vats with the ripening cream are placed. At A is a tap for filling the tank with water. The tap at C serves for emptying the tank; at B is a cut in the side of the tank deep enough to provide such an overflow of water that even with the tap A open to its fullest extent no danger arises of the vats being submerged and water running over their sides. If steam is available, then a steam pipe with a cock at E is provided for heating purposes. The contrivance above outlined is the oldest and simplest "cream ripener" in practical use.

The cream should frequently be stirred by the "stirrer" (fig. 2). The temperature of the water can be regulated, and it is not difficult to impart to the cream the desired temperature and maintain it there, provided the cream is stirred frequently enough. If you have water at 15° C. (59° F.), and you wish to ripen the cream at that temperature, all you have to do is to leave the tap A running, the superfluous water will run off at B, and, as the water is continuously renewed, the temperature remains at 15° C.

Fig II

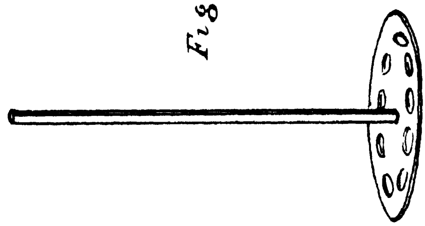
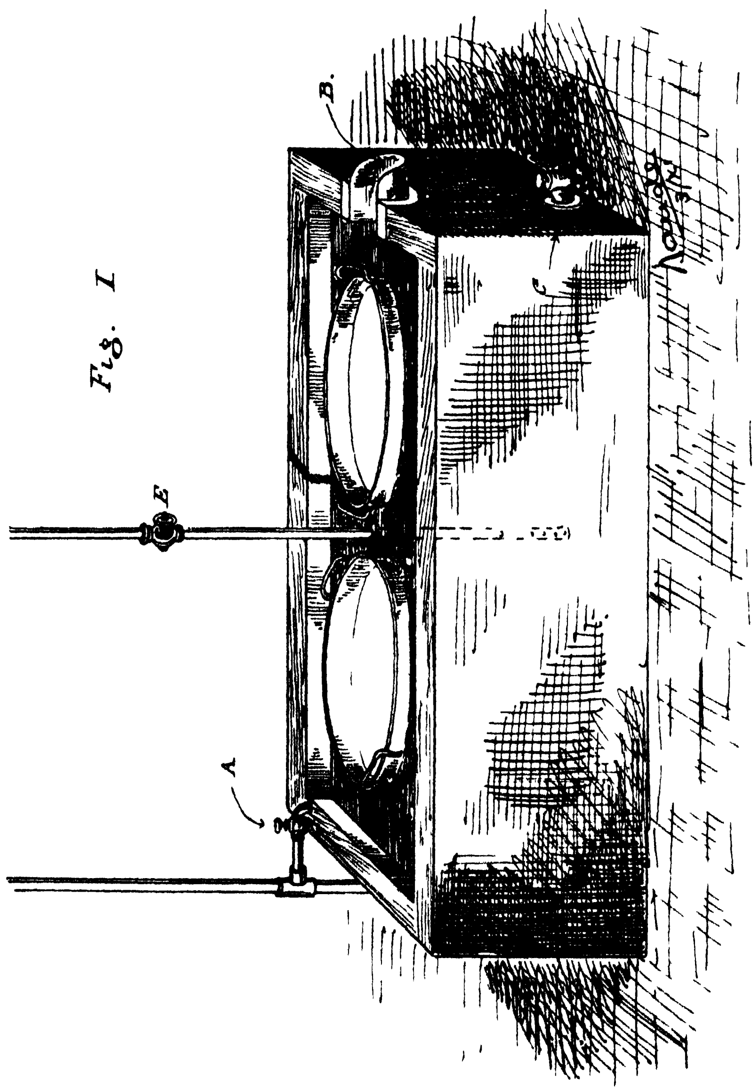


Fig. I



In practice this is called "flushing". However, this cream ripener has many faults. Practice has shown that everything acts satisfactorily so long as you frequently in pect the cream, stir, and temper it. If the cream is left unattended it will often happen during cold nights that the temperature of the cream drops too much, and a wrong fermentation sets in.

Different types of cream ripeners showing many improvements have since been brought on the market. The greatest drawback of these instruments at present is the rather prohibitive price. For a modern cream ripener we can insist on the following requirements:—

1. The mass of cream should be well mixed so as to secure a homogeneous composition.

2. The tempering should be rapid and easy without stirring the cream too much or too long.

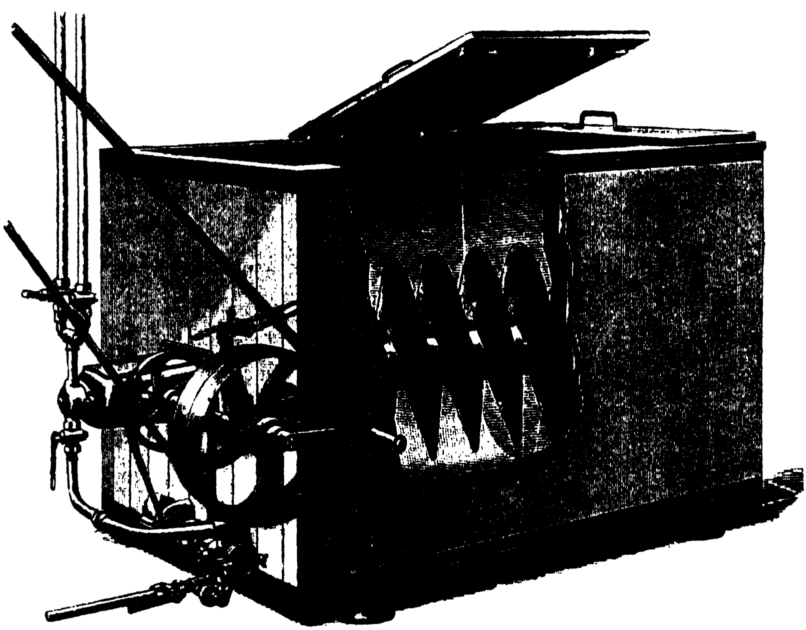


Fig. 3.
Type "Astra".

3. The cream ripener should be well insulated. Once the cream has been brought to a certain temperature this temperature should be preserved for a long time. Next morning you ought to find the cream at the same temperature as the previous evening, and if there is a difference it should be a very small one. Some types of modern cream ripeners can be seen in figs. 4, 5, 6.

The "Astra" cream ripener (fig. 3) is a European improvement of the American "Wizard Agitator". The coil visible in the picture is hollow, and through it hot or cold water is run in order to heat or cool the cream. A special pump is provided for circulating the liquid through this coil. The coil itself turns and imparts to the cream a slowly revolving movement which ensures a thorough mixing. Gradually each particle of cream touches the blades and is

heated or cooled. The question whether the instrument was originally designed in America or in Germany is a side issue, and does not interest us. An ice chamber is provided, through which the cooling water circulates.

This cream ripener is made in various sizes, from 90 to 550 gallons capacity. I do not know the prices, but these can be supplied by the agents of the makers in South Africa. The "Reform" cream

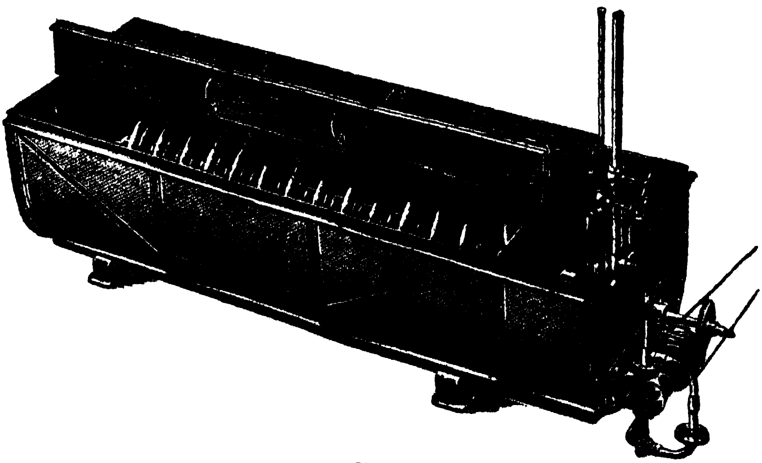


Fig. 4.
Type "Reform".

ripener in fig. 4. is somewhat differently constructed, but its action is very similar to the "Astra". Here the sizes are 130 to 650 gallons capacity, and prices run from £60 to £175, f.o.r. Germany. A difference is that whereas in the smaller sizes of the "Astra" the screw may be turned by hand, the "Reform" screw is made to be turned by power.

Fig. 5, shows the "Fortschritt" cream ripener. In the place of the revolving screw there is a series of pipes which move

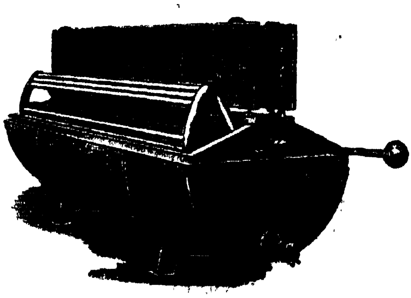


Fig. 5.

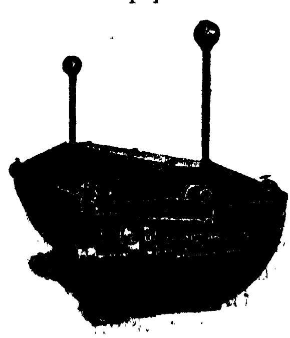


Fig. 6.

Type "Fortschritt".

up and down, describing a semi-circle. Here the sizes are 180 to 440 gallons capacity, and the prices £71 to £118. 10s. f.o.r. Germany. The construction is simpler and the price lower than the "Reform". A "Reform" of 440 gallons costs £128. 15s., and a "Fortschritt" of the same capacity £118. 10s.

Sizes and prices of cream ripeners are such that their use will be limited to creameries. The farmers will have to be contented with the older type (Plate I, figs. 1 and 2), which can be constructed in South Africa for a few pounds. Say the wooden tank will cost £5, the taps £1. 10s., the two cream vats £3, and the stirrer 10s., then the whole arrangement is complete for £10. If instead of ordering a tank you take a large cask and saw it through at a convenient height from one end, take one cream vat instead of two, then the whole will cost less than £5. A cream ripener can, therefore, be considered to be within the reach of the majority of the farmers.

I already pointed out that both processes taking place during ripening, the changes in the protein and the souring of the cream, are due to the growth and activity of certain bacteria. For this they should predominate in the cream and oust the other species. Now, it is possible to make the ripening process of cream safer and surer by pasteurizing the cream first. I will not describe the pasteurization here, but refer to Bulletin No. 125, "The Pasteurizer". In pasteurized cream the majority of the bacteria has been killed, and the germs introduced by means of "pure culture" or "starter" have a free scope. Starter can be used in different ways, and I will briefly describe the different modes of use.

The use of Buttermilk.—The oldest and simplest method is that after churning part of the buttermilk is reserved and used as starter for the cream. This presupposes daily churning, for if the buttermilk is over-kept the lactic acid bacteria would dominate too much, and the cream be rendered too sharply sour. The method is suitable if buttermilk is to be had derived from finely ripened first-class cream, but it has a great disadvantage. You continuously cultivate from the same culture, and that culture will gradually be "soiled". This means that gradually strange bacteria will enter the buttermilk, the culture is less pure, and the quality of the butter declines. If this happened suddenly, every buttermaker would notice it, but it is an insidious, slow process escaping observation. Every day the buttermilk is a trifle more soiled, and the quality of the butter a trifle less good, till in the end you are making bad butter without noticing it. You can counteract this soiling by extreme cleanliness in all manipulations, but it is impossible to prevent it.

The use of Sour Cream.—This is a modification of the previous method. Instead of taking the starter from the buttermilk after churning, you take it from the cream before. This method is subject to the same danger of contamination of the culture, and I have not yet discovered its special advantages. Without entering into theoretical considerations, I will only say that I have seen no specially good results of this method in practice, and therefore cannot recommend it.

Spontaneously Soured Pasteurized Separator Milk.—Separated skim milk is pasteurized at a temperature of 90° C. (194° F.) and left for twenty-four hours. Then the milk has turned sour, and this sour milk is used as a starter. This method places me in a difficult position, as in this case theory and practice flatly contradict each other. I am accustomed to rely chiefly on practical experience, but as an "expert" I have to show a certain deference to the theory. In theory I must absolutely condemn this method. The high temperature of pasteurization ensures that all lactic acid bacteria have been

killed. Then if the milk turns sour it must be caused by germs dropping into it from the atmosphere, and with the right kind of bacteria certain wrong species are bound to come too. In this way you obtain a starter that contains wrong germs, which may exert a harmful influence on the quality of the butter.

Now for practice. I have seen this method put into practice in one of the largest creameries in northern Germany; no salt nor any other preservative was added to the butter, which was not washed, but went straight from the churn to the butter worker. This butter was packed in tins and the latter supplied to the steamers of the Hamburg-American Line under guarantee that the butter would keep fresh for three months. There were no complaints.

This method I therefore strictly object to in theory, and at the same time I recommend it for practice. This shows again that science has by no means yet succeeded in unveiling all the mysteries of the ripening process.

The use of Pure Culture.—The beginning is the same as in the previous method—skim milk is pasteurized at a high temperature, upon which the pure culture (obtainable in liquid and in powder form) is added. For the various pure cultures the treatment is a little different, but full directions for use are found with each bottle. The skim milk is covered with butter gauze and kept at a suitable temperature till the starter is ready.

Several laboratories make it their special business to prepare and sell such pure culture and as competition is very keen, you can find unfavourable reports on nearly every pure culture in technical literature. Each laboratory analyses the cultures of competitors, and as a rule finds these of minor quality. At least, the result is published in those cases only when the report is unfavourable.

Without recommending a special culture I will say that there are a few on the market now that may be used successfully for butter-making, provided you take care to buy fresh cultures only. Most pure cultures degenerate when they grow older. As the journey to South Africa takes such a long time, the condition ought to be made that the culture be prepared locally. I know of no reason why this should not be possible; all that is wanted is that somebody takes up the matter and prepares pure culture for sale.

I have seen the culture method applied in different ways. The first was really a continuation of the old process with buttermilk. Starter was made as described, but further the buttermilk was used as a starter till starter was made afresh again. This is certainly an improvement on the buttermilk method, and will result in better butter, but still better results can be obtained by applying the second method.

Separated skim milk is pasteurized daily, and starter is used and made daily. Then a sharp distinction should be made between two series. One is called the "parent culture", the other "starter". You begin by making "parent culture" as described; this is transplanted on a quantity of pasteurized skim milk. You have to transplant twice daily—once a small quantity of parent culture, the other a large quantity to make starter.

Starter is used for ripening the cream, and parent culture is used exclusively for making starter. This method is the most elaborate,

but certainly the best for cream ripening. Whichever method may be applied a few rules should be observed in any and every case.

Ripening cream should be protected against bacteria or dust; some covering is required. Then the temperature should be kept constant. It should be a fixed rule never to use the top layer of the starter; this is skimmed off and discarded. Bacteria and dirt silting in are most likely to be found in the top layer, and therefore it is better to exclude this from use.

Now two important points come up for consideration, the temperature of ripening and the quantity of starter to be used. Unfortunately opinions are divided to such an extent that I will have to limit myself to enumerating the arguments in favour and against, without giving a decided recommendation.

The Ripening Temperature.—As extreme limits, 10° C. (50° F.), and 22° C. (71° F.) may be taken. Usually a distinction is made between "cold ripening" at 10 to 15° C. (50 to 59° F.) and "warm" ripening about 18 to 22° C. (69 to 71° F.). I have used both methods and have seen good results from both, yet there are differences in application.

The advantage of cold ripening is the tendency of the milk fat to solidify, which will render the butter firmer. The disadvantage is that ripening is slower, and the favourable bacteria take longer to establish their dominancy, which means that the cream is exposed to the danger of a wrong fermentation.

Warm ripening has the advantage of shortening the process, as it takes the desired bacteria less time to get fully established, but the disadvantage is that the butter will be less firm, and if a wrong fermentation should start it will be more intense. As a rule, circumstances will have to decide which system will be applied. In hot weather cold ripening will be preferable so as to have the butter firmer. If it is very cold the butter might become far too firm, and it may be better to apply warm ripening.

Then it also makes a difference whether you are dealing with pasteurized cream or not. For pasteurized cream cold ripening is more suitable, for unpasteurized cream warm ripening.

If you want to make butter of a regular quality a definite choice should be made between the two systems. It is not good enough to say : "Cream may be ripened at 50° F. and at 70° F., hence a few degrees do not matter." Such slovenliness would result in butter of irregular quality, differing one day from the other, and it would be difficult to secure buyers for such a product.

The quantity of starter used varies very much, and from practice I remember 3 per cent. as the minimum and 20 per cent. as the maximum quantity. This should be arranged in accordance with the ripening temperature, a lower temperature requiring a larger quantity and a higher temperature a smaller quantity of starter. I should like to see the limits placed at 4 to 10 per cent. Pasteurized cream requires more starter than raw cream, and American ripening takes more starter than European ripening. The American method is to ripen cream in ten hours, that is ten hours after adding starter the cream is fit for the churn. The European custom is to ripen the cream in eighteen to twenty-four hours. The American method saves time and labour, but the European method ensures a better quality butter.

I know very well that creameries trying to apply my hints about cream ripening will meet enormous practical difficulties. First and foremost of them is the miserable condition of the bulk of the cream received. It is not the question how to ripen this cream in order to make tip-top butter, but rather save what can be saved and turn the cream as well as possible into butter.

This state of affairs is the cause of the great instrinsic weakness of our South African butter industry, and our dairymen should not be satisfied with it, but persistently press for improvement. By not only testing the cream for butter fat, but at the same time grading it according to quality and acidity, much can be done. When the supplier knows he will obtain a higher price for the cream when it is fresh and sweet, he has an incentive for supplying sweet cream. When the creameries receive sweeter cream they can in their turn ensure a better ripening. Progress in this direction is to the benefit of every one concerned. The creamery in a position to offer a higher grade product will receive better prices, and will be able to pay higher prices for cream to the farmers.

Teff Grass (*Eragrostis Abyssinica*).

By J. WENTWORTH-SYKES.

I HAVE been asked by the Government Agrostologist and Botanist, Mr. J. Burtt-Davy, F.L.S., to write an article on this valuable forage grass from a practical point of view, for the information of farmers wishing to give it a trial in South Africa, but I feel sure he will bear with me if I first touch slightly on its history, introduction, growth, and feeding properties on which he is our authority.

Teff, as its scientific name implies, is an inhabitant of Abyssinia, where it is much cultivated in the hill country as an article of diet, and although there are several varieties, the two most popular are white teff, which is grown in the dry season, and red teff, which is grown in the wet season.

The flour ground from white teff is used by the upper classes of Abyssinians for making bread (tabita) and that from red teff by the poorer classes.

I do not think white teff has yet been tried in South Africa, as I doubt whether our climate would suit it, but red teff has certainly come to stay, as witness the hundreds of tons of hay sold last year on Johannesburg and Pretoria markets, which is but a tithe of that sold privately or fed locally.

The honour of bringing this valuable grass to South Africa is due to Mr. Burtt-Davy, who, after introducing it to California, brought a few pounds of seed with him to the Transvaal in 1903, and it has proved so prolific in seed that it would be difficult to estimate the amount or area of grass in South Africa this season from that small commencement. I, myself, have sent large consignments of seed to all the Provinces of the Union, Rhodesia, Portuguese Territory, and British East Africa.

Red teff, if it once gets a good rain to cause the seed to germinate, is of remarkably quick growth. I have cut my first cut for hay seven weeks from the day I sowed it. When it grows sufficiently to shade the sun's rays from its roots its progress is simply phenomenal.

Its feeding properties cannot be gainsaid, as the only analysis I have seen in print shows:

Water	15.2
Albuminoids	8.2
Starch, etc.	68.1
Oil	2.8
Cellulose, etc.	2.8
Ash	2.9
Total	100.0

Cattle, horses, sheep, and pigs devour it eagerly. Several breeders of blood-horses have written me that they find it excellent for young stock. A friend of mine farming near Britten declares that his cattle will leave green lucerne for it, and I have a letter from a prominent dairyman in the Witwatersrand District who avers that his milk supply was increased at least 5 per cent. by feeding his cows on teff.

I find 4 lb. of seed is the proper quantity to sow to the acre. I used to advocate 3 lb., but found 4 lb. gave a finer texture to the grass, and in consequence it commands a higher market value. To clean dirty lands I advise sowing 5 lb. Teff actually chokes black-jackets, pigweed, and other noxious growths, and those that struggle through as a result of patchy sowing, being of slower development, are usually cut before the weed seeds ripen, and as teff is a heavy stooler after cutting, the second growth obliterates them completely.

The seed being so fine—midway between tobacco and lucerne in size—it is necessary, if one is experimenting on a small scale, to mix it with sand or dry earth at about the proportion of 40 to 1 in order to successfully broadcast it, but as a large grower I use a Cahoon Broadcast Sower—a little machine which costs £1—carried on the breast and worked by turning a handle. Half an hour's experience will teach the farmer how far to open the little gate through which the seed falls into the revolving wheel which spreads it, and with this machine I can comfortably sow 20 acres in a working day.

Teff will thrive on any ground, wet or dry, but I find red soil of a porous sandy nature is most suitable. The heaviest crop (nearly 3½ tons to the acre) I ever grew was in vlei ground under water, accidentally caused by excessive rainfall and the bursting of the Witwatersrand and other dams, the water lying some inches deep on the ground for weeks, but the weight of seed and the buffeting of wind and rain caused the grass to fall over so that a large quantity of the seed and grass was wet and ruined.

I would suggest to farmers to plough and harrow their ground well before sowing in order to get a nice tilth. After sowing, I never harrow the ground. I prefer to *roll* it in order to press the seed into the ground and crush all clods not broken by the harrow—which one appreciates when sitting on the mowing machine. But latterly I have found that the first rain does all the harrowing necessary. Teff intended for hay should be cut before the seed is fully formed, and if the crop has been sown early, the second cut can be allowed to run to seed, and should be harvested before it becomes too yellow, otherwise most of the seed will shake out and be lost.

Many growers prefer to sow in January, and when the crop is nearly ripe turn their stock on, and the seed shaken out will resow the ground for another season. This I regard as risky, for early frosts are not unusual on the high veld, and the seeding and a large proportion of the feeding properties of the crop are destroyed.

I have had many letters from farmers in different parts of the Union asking for advice on teff growing, and I have taken as pointers in this article the main items on which they are in doubt and have

desired information, and as it will be admitted that teff can be luxuriantly grown where lucerne will not live, and being so well adapted to withstand drought, I venture to prophesy it will be one of the most valuable farm crops of the country.

NOTE.—Some growers find that 7 lb. of seed per acre gives better results than a lighter sowing, but this probably depends partly on the soil and climate. Under ordinary conditions as much as 2½ tons of dry hay per acre has been harvested in one season by sowing in October and allowing a second crop to grow from the same stand after the first cutting. Good grazing can be obtained from the "aftermath" until the frosts. The short growing season required by teff makes it an invaluable hay crop for regions where the rainy season is short and the total rainfall is light. The principal point to be observed in the successful cultivation of teff is the preparation of a fine, level seed-bed and the sowing of the seed at such a time as will avoid its ripening during the period of continuous rain; for this purpose October and January usually prove the most satisfactory.—J. BURTT-DAVY.

Types of the Merino.

MR. W. HELMBOLD, Waaihoek, P.O. Walkers Post, Orange Free State, writes :—I was greatly pleased to see an article on the above in the first number of the new *Union Agricultural Journal*, and as a great admirer of the Wanganella type of merino and a firm believer in the suitability of these sheep for the drier parts of South Africa, I beg leave to refer to this question again, and especially in connection with the point at issue, whether the Riverina sheep are all pure merinos or contain an admixture of English long-wool blood.

What Mr. McCall states about the breeding of the "Wanganella" is practically in accord with Bruin, "Australian Studs", but it is not all the information which this writer supplies. According to Bruin, Messrs. Peppin & Sons bought the Wanganella squatting run in 1858 and used it for fattening sheep. At the same time a breeding flock was formed from *the best ewes in the general flock*, and some sheep from the famous Mount Crawford flock were included.

In 1861 a stud flock was formed, this foundation being 200 of the *best ewes in the breeding flock* and 100 ewes from Canally Station, N.S.W. With the stud thus formed imported French and German rams were used. One of the French rams, named the Emperor, was at that time famous for his large well-shaped frame and heavy fleece, shearing for several years a fleece of 25 lb. The Emperor had great prepotent power, and stamped his flock with his good qualities. Indeed, the stud may be said to be of the Rambouillet type, as the rams of that descent were generally selected for use, it being better adapted to the conditions of life in Riverina than the smaller Negretti. Occasionally the latter type crops up in this stud, and doubtless many of the famous stud sires have got their density of wool from the Negretti blood in their ancestry. In 1866 two Vermont rams of the blood of old Grimes were introduced into the stud. These sheep, which were different from the modern Vermont in not having any body wrinkles, mixed well with the Wanganella stud ewes, and their stock were noted for their heavy fleeces of robust combing wool.

These American rams were the last sheep introduced into the Wanganella stud, which since 1866 has received no infusion of outside blood. And herein lies the great value of the Wanganella sheep, that it has been bred to a fixed type for the last 45 years, a type giving a good carcass, a fairly heavy fleece of bold combing wool, light in the grease and valuable on that account, and withal a sheep with a grand constitution. Now, the farmer hazarding the information that a Wanganella was a grade Lincoln would no doubt find it difficult to prove his statement. But I fancy Mr. McCall would find it equally difficult to prove that at the time the Wanganella stud flock was formed no Riverina sheep contained any admixture of English long-wool blood whatever. I have seen a good many imported Riverina sheep and I have been struck from time to time with a ewe having a more or less distinct likeness to a come-back Leicester or other long-wool breed, showing the bare head, ears carried backwards, round ribs, heavy quarters, and the type of wool not quite the merino.

The question of Leicester blood in Australian sheep caused some correspondence in *The Australasian* in 1881. A lengthy correspondence did not seem to prove anything for or against an admixture of English long-wool blood in the stud flock formed by Mr. C. B. Fisher in South Australia in 1854 or 1855, although it was admitted by the breeder that Lord Western's rams were used, and Spooner ("The Sheep") states, page 77: "Lord Western still retained a flock of Anglo-merinos, i.e. merinos crossed with the Leicester, and the mixed breed thus produced afterwards perpetuated. A few years ago, it is said that these were fine sheep, but those exhibited at the Smithfield Show in 1843 were very much degenerated."

Besides, when we consider that the first lot of merino sheep introduced from the Cape into Australia by Captains Waterhouse and Kent only numbered twenty-nine, that about half of this number died on the voyage, and that at least eight different people were supplied with sheep from this importation, we can hardly imagine that this first introduction can have been useful for much more than grading up the flocks existing in the young colony.

In a letter to Sir Joseph Banks, Capt. Waterhouse states, *inter alia:* "I apprehend that the real Spanish breed is in the hands of most of those who turned their minds to raising sheep. I am not a judge of wool, but understand from some of those who pretend to understand it that when a Cape or Irish ewe is crossed by a Spanish ram, and their progeny again crossed by the Spanish ram, the wool is very little inferior to the Spanish."

See also Bruin, "Australian Studs", page 101:—"In 1830 the wool from the pure merino realized in London from 3s. 3d. to 3s. 1d. per lb., while the cross between the merino and the common sheep brought from 11d. to 2s. per lb. This refers to Tasmania."

Further, page 100: "The first shipment of sheep to Tasmania of which we have any notice was made in the ship 'Tranmere' in 1826, when 10 rams and 40 ewes, pure Cotswold, were imported. In 1827 the 'Caroline' brought 103 rams and 161 ewes, pure Saxon merinos, at £14. 19s. 6d. per head. There were thus about 100 rams in this importation which could not have been used for anything else but for grading up the common sheep, and although some stud flocks were no doubt kept pure it is quite likely that when stud breeding became more general a good many studs started with sheep having an admixture of English, Indian, Irish, or Cape fat-tail blood; and I think it is just this small infusion of English long-wool blood which has given the present Riverina sheep their size, length of staple, lustre, and, last but not least, their grand constitution, so that I do not see why Australian breeders should be so touchy on this point, because there is no doubt that Australia to-day is at the top of the tree in merino breeding, and is bound to remain there if they only know when to stop pouring in the Vermont blood."

Crotalaria Burkeana.

By JOSEPH BURTT-DAVY, F.L.S., Government Agrostologist and Botanist.

DR. THEILER's article in the February *Journal* has brought a flood of correspondence from all parts of the Union asking for the identification of specimens submitted. Some of them are the true plant, but most of them belong to species of Indigofera (Wild Indigo), Vigna, and Rhynchosia, genera of the family Leguminosae, which may possibly be responsible for the trouble, but which are not yet known to be injurious.

To aid farmers in identifying *Crotalaria Burkeana*, a photograph of a flowering specimen is shown on plate, which supplements the fruiting specimen illustrated in the February issue of the *Journal*; it does not, however, show the characteristic hairs. The following description may assist in determining the plant:—

Stems branched, 1 to 2 feet high, woody below, covered with stiff, spreading, rusty-brown hairs. Petioles (leaf-stalks), 1 to 1½ inches long, bearing three to five leaflets at the top, the leaflets one to two lines wide. Flowers pea-shaped, about ¾ inch long, yellowish with purplish-brown veins, seven to fifteen together on a long peduncle (flower-stalk). Pods swollen, brown, about 1½ inches long.

(*Photo by A. W. Bayly, Barberton.*) **Crotalaria Burkeana,** Benth.

This illustration supplements the one which appeared in the February *Journal*, and shows the plant when in flower.

Dairy Herd Records.

THE following is the milk record of the dairy herd at the Elsenburg Agricultural College, for the month of February :—

Breed and Name of Cow.	Days in Milk.	Yield in Lb.		
		During February.	Total to Date.	Daily Average.
FRIESLANDS.				
Beauty	390	122	7907	20·2
Cleopatra	311	238	7856	25·2
Romula	267	289	4777	17·8
Violet	245	234	6161	25·1
Vera	223	280	5624	25·2
Belladonna	199	363	5434	27·3
Rose	165	616	5690	34·4
Bell	94	766	3117	33·1
Veronica	71	683	1953	27·4
Boerin	44	539	854	19·4
Cato	3	54	54	18·0
JERSEYS.				
Gwendolen	305	244	5255	17·2
Gladys	297	208	4572	15·3
Grace	298	264	5191	17·4
Gus...	256	324	4743	18·5
Petunia	238	253	3578	15·0
Gilliflower...	234	246	4441	19·0
Fanny	223	293	4261	19·1
Evelyn	181	314	2576	14·2
Glee	164	472	3964	24·1
AYRSHIRES.				
Lobelia	240	142	4776	19·9
Queen Dot...	187	369	4160	22·2
SHORTHORN.				
Helen	160	251	1975	12·3
CROSSES.				
Bessie	267	338	8743	32·7
Disa	256	492	6814	26·6

Average percentage of Butter Fat		
	Frieslands	3·1 per cent.
	Jerseys	4·9 ,,
	Shorthorn	3·9 ,,
	Ayrshires	4·3 ,,

It is also proposed to publish monthly records of milk yields from some of the cows in the dairy herds at Tweespruit and Grootvlei, in the Orange Free State, for the information of dairymen and stock breeders, and the following are records for the month of January. It will be observed that a number of the cows included have been in milk for a considerable time, hence the present yield from them is small.

TWEESPRUIT EXPERIMENTAL FARM.

BREED AND NAME OF COW.	Date Last Calving.	Lb. Milk in Month.	Fat Test.
FRIESLANDS.	1910.		%
Rinske III.	16th September	1140	3·6
Nora	20th October	1129	3·2
Japke	11th June	787	3·6
Geentje	23rd November	950	3·6
Dykstra	18th November	888	3·0
Tryntje	13th December	1032	2·8
LINCOLN REDS.—			
Crino	6th March	304	4·0
Dirce	30th June	428	4·2
Daphne	22nd December	923	3·4
Clusia	26th August	452	3·2
Bracebridge	10th October	602	3·6

GROOTVLEI EXPERIMENTAL FARM.

SOUTH DEVONS.	1910.		
Primrose	13th October	868	3·6
Opal	10th November	682	4·2
Merry Glass	19th November	1030	3·7

Western Province Agricultural Society.

THIRD EGG-LAYING COMPETITION.

(Commenced 1st May, 1910; to finish 30th April, 1911.) (Four Birds to a Pen.)

Record for FEBRUARY, and Totals to end of February, 1911.

Pen Number.	Owner.	Breed.	Record for Month. Eggs.	Weight. oz.	dwts.	Total to Date. Eggs.	Weight. oz.	dwts.	Position to Date.
1	W. P. Cowan....	White Leghorns (Eng.).......	57	117	6	446	845	1	5th
2	B. Kauffmann...	Brown Leghorns............	52	99	2	415	768	12	10th
3	K. B. Jobling....	White Wyandottes..........	33	64	6	347	673	5	15th
4	R. G. Hudson...	Brown Leghorns............	28	56	13	252	504	15	34th
5	K. B. Jobling....	White Leghorns (Aust.-Amer.).	45	94	6	383	746	8	12th
6	S. A. West......	White Leghorns (Amer.)......	24	48	7	372	754	1	11th
7	A. F. Rackstraw.	White Wyandottes......	7	13	7	167	345	3	48th
8	J. W. Wright....	White Wyandottes..........	25	46	2	244	469	3	38th
9	R. W. Hazell....	Columbian (1 dead)..........	22	44	2	130	258	8	52nd
10	S. A. West......	White Leghorns (Amer.)......	49	102	13	330	661	14	16th
11	C. H. v. Breda...	White Leghorns (Amer.)......	29	61	9	265	549	12	29th
12	S. C. Skaife......	White Wyandottes..........	44	81	12	303	553	9	26th
13	R. W. Hazell....	White Orpingtons...........	24	52	7	206	427	7	44th
14	Clif. Hoole......	Buff Leghorns..............	34	62	15	290	565	8	23rd
15	F. T. Hobbs.....	Silver Wyandottes..........	26	50	2	233	432	12	42nd
16	B. Kauffmann...	Black Minorcas (1 dead)......	14	31	15	163	361	5	47th
17	S. C. Boyes......	White Leghorns (Amer.)......	41	83	13	488	967	3	2nd
18	A. Aitken.......	White Leghorns (Amer.)......	54	105	14	487	931	6	4th
19	F. Muller.......	Black Minorcas.............	—	—		164	338	0	49th
20	B. Kauffmann...	Brown Leghorns............	50	93	9	308	558	4	24th
21	R. W. Hazell....	White Wyandottes (1 dead)...	36	72	13	197	395	11	45th
22	J. P. Seabrook...	Blue Andalusians...........	63	130	6	333	680	5	13th
23	S. A. West......	Red Sussex................	37	69	6	235	438	8	40th
24	R. W. Hazell....	White Wyandottes..........	52	106	1	301	600	3	18th
25	J. Leibbrandt...	White Wyandottes..........	35	72	11	264	524	7	32nd
26	R. G. Hudson...	Black Wyandottes..........	39	72	9	305	578	2	21st
27	H. H. Bright....	White Leghorns (Eng.).......	57	114	15	280	556	5	25th
28	O. C. Macpherson	White Leghorns (Amer.)......	42	83	15	264	525	15	31st
29	H. H. Bright....	Black Leghorns (1 dead)......	40	80	3	275	506	15	33rd
30	H. H Bright....	White Leghorns (Eng.).......	40	82	15	234	469	15	35th
31	C. H. v. Breda...	White Leghorns (Amer.)......	44	86	11	423	790	2	8th
32	S. Smith........	Brown Leghorns (3 dead).....	18	38	11	298	551	11	27th
33	F. T. Hobbs.....	Silver Wyandottes..........	13	24	10	143	270	7	51st
34	A. Keppie.......	White Wyandottes..........	46	85	2	332	608	9	17th
35	C. H. v. Breda...	White Leghorns (Aust.).......	38	71	1	577	1030	1	1st
36	S. Smith........	White Leghorns (Danish-Am.).	14	29	7	419	788	7	9th
37	F. T. Hobbs.....	Silver Wyandottes..........	35	64	13	238	429	6	43rd
38	Vacant.........	—	—	—		—	—		—
39	C. H. v. Breda...	White Leghorns (Aust.-Amer.).	48	91	2	510	938	11	3rd
40	R. J. Williams...	Black Minorcas (2 dead)......	9	21	3	91	217	11	53rd
41	F. Muller.......	Black Minorcas (1 dead)......	26	54	0	213	434	3	41st
42	C. H. v. Breda...	White Leghorns (Amer.)......	42	90	15	270	588	6	19th
43	I. E. Wright.....	Brown Leghorns (2 dead) (Pen withdrawn)	1	2	0	134	271	14	50th
44	C. H. v. Breda...	White Leghorns (Aust.-Amer.) (1 dead)	24	48	10	421	814	0	7th
45	B. Kauffmann...	White Leghorns (Eng.)........	42	83	8	267	527	1	30th
46	S. A. West......	Brown Leghorns.......... ..	45	92	11	291	568	1	22nd
47	R. W. Hazell....	Black Orpingtons...........	19	39	9	227	443	7	39th
48	C. W. Pilkington.	Rhode Island Reds..........	29	63	2	211	461	6	37th
49	S. Smith........	Brown Leghorns (2 dead).....	8	18	3	213	391	15	46th
50	C. H. v. Breda...	White Leghorns (Aust.-Amer.) (1 dead)	43	78	3	460	816	1	6th
51	K. B. Jobling....	White Leghorns (Aust.-Amer.) (1 dead)	34	72	2	281	549	13	28th
52	S. A. West......	Brown Leghorns (1 dead).....	47	99	3	238	463	2	36th
53	N. Cole.........	Brown Leghorns.......... ...	39	81	14	343	673	15	14th
54	K. B. Jobling....	White Leghorns (Amer.) (1 dead)	44	89	10	299	584	5	20th

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

CROSSING SHEEP.

To the EDITOR of the *Agricultural Journal.*

SIR,—In the first issue of the *Union Agricultural Journal*, I notice a letter by Mr. J. E. Contat, in reply to Mr. Steyn, of Rhodes, *re* the crossing of sheep. As Mr. Steyn would no doubt like to have the experience of others also, I will give mine, which, in the main, agrees with Mr. Contat's.

Some years ago, when farming in East Griqualand, I imported some Lincolns, which I crossed with the merino. The lambs were fine and strong, and as shearlings gave a slightly heavier fleece than my merino lambs, but after that they did not seem to do as well as the merino. I think the wet had a great deal to do with it; their wool being more open, they got more readily soaked. They also seemed to suffer more from intestinal parasites. They are more difficult to keep within bounds than the pure merino; still, I found seven wires sufficient if laced every 3 ft. 6 in. apart.

I tried the pure-bred Lincoln, but that was a complete failure. They seemed to be always suffering from nasal catarrh.

About that time large flocks of young sheep of the Lincoln-merino cross came into East Griqualand from Barkly East. I believe they were bred by Mr. Orpen on a fairly large scale. They were fine young sheep and were bought by speculators for the Transvaal. It would be interesting to know if Mr. Orpen is still keeping on with the crossing.

I do not think that Mr. Steyn can do better than keep to the merino, as, from what I know of his part of the country, the merino does well.—Yours, etc.,

D. B. MENNE.

Greytown, Natal.

To the EDITOR of the *Agricultural Journal.*

SIR,—In reply to Mr. H. L. Steyn's letter on the above subject in the *Cape Agricultural Journal* of December last, I wish to state that I can fully corroborate the statement made by Mr. J. E. Contat in his letter of the 16th January, and I think the Shropshire ram which he mentions was purchased from myself.

The first cross Shropshire-merino is a nice, robust animal, carrying a fair fleece, although somewhat light; he matures early, and, in my opinion, is admirably suited for disposing of as butcher lamb;

but the second and each succeeding cross appear to deteriorate and develop a tendency for roaming and creeping through wire fences, no matter how substantial. Of course, each farmer has to consider climatic conditions and any peculiar surroundings, but I think it a great error for any farmer, where it is possible to farm successfully with the merino, to attempt to cross with any other breed, as my experience in crossing with Shropshire, South Devon, and Persian has all proved most disastrous.

If memory does not play me false, I think Mr. Orpen, of New England, made the experiment some years ago of crossing on a large scale with some of the English breeds. Perhaps Mr. Orpen would give us his experience. I am sure it would be instructive.—Yours, etc.,

W. A. HART.

Marrow Vale, Ugie,
East Griqualand, Cape Province.

HEREDITY.

To the EDITOR of the *Agricultural Journal.*

SIR,—With reference to the article on "Heredity" in your February issue on page 45, reference is made to a pregnant mother wounding her foot and her child when born having a similar mark.

Just after the late war, I saw two cows which had just calved, and the calves had exactly the same ear-marks as the mothers, viz., three half-moons in front of left ear. The mothers were served in Australia, and the calves were born shortly after landing in South Africa. I saw the calves when they were only a few days old, and am certain that they had not been ear-marked after birth. The two cows in question were part of a shipment of about 200, and the owner informed me that several of the cows had borne calves with the same ear-marks as themselves.—Yours, etc.,

HAROLD T. SILLS.

Carlton, Dordrecht, Cape Province.

To the EDITOR of the *Agricultural Journal.*

SIR,—Mr. Dale's article on "Heredity" in your first issue is very interesting. The paragraph beginning "The writer knows, etc." (page 45) relates to a curious experience which I can cap. Five years ago I bought a beautifully bred thoroughbred mare in bad condition, with open wounds, one particularly noticeable over the right eye, which is now opaque. I was told that the mare was very poor when about to foal, and eventually the dead foal was dragged out by an ignorant operator; during this performance the mare repeatedly hit her head on the ground. After a long interval this mare foaled a fine big filly last September, which, however, was minus its right eye, and the right cheek was deformed. It lived twenty-four hours only. It will be of considerable interest, should the mare, as appears likely, have another foal, to see whether the impression is permanent. —Yours, etc.,

FRED HEDGER.

Achtertang, Cape Province.

To the EDITOR of the *Agricultural Journal.*

SIR,—I have read with much interest Mr. Dale's article on "Heredity" in your February number, and, as a poultry breeder, I was specially interested in his account of his attempt to produce a blue fowl which would breed true to colour. I think that, perhaps, the reason for his failure is that both the black in the black fowl and the white in the white fowl are dominant over the other. It is thought that a new or acquired characteristic is dominant over the old or original one. Now, the original fowl was neither black nor white, but speckled or "game" (as most barndoor fowls still are). Both the black colour and the white colour should be dominant over this original colour, but neither necessarily over the other. It would be very interesting if Mr. Dale would try mating his black and white birds with birds of the original colour, and see if they came true to Mendel's principles. If so, it would tend to show that what Mr. Dale got from his blue first cross birds was 25 per cent. black dominants, 25 per cent. white dominants, and 50 per cent. double or mixed dominants, and no recessives. As evidence that the new characteristic is dominant over the original, I would quote the two instances given by Mr. Dale, viz., that rose comb is dominant over single comb in fowls, and polled head over horned in cattle. The original fowl is single combed and original cattle are horned.—Yours, etc.,

A. DE A. DONISTHORPE.

Num-Num, Nylstroom.

BLUESTONE FOR WIRE-WORM IN OSTRICHES.

To the EDITOR of the *Agricultural Journal.*

SIR,—In the December issue of the *Cape Agricultural Journal*, a letter appeared from Mr. N. C. Allrish, Welbedacht, Willowmore Division, to which, at the time, I was unable to reply, owing to the Cape journal having ceased publication with that month's issue. I was therefore obliged to content myself by writing to Mr. Allrish privately, reserving my present reply till the advent of the *Union Agricultural Journal.*

Briefly, the gentleman referred to had lost a number of young ostriches through dosing for wire-worm. He attributed his loss directly to the use of bluestone in quantities which I had recommended in previous correspondence to the *Cape Journal* as being safe.

In addition to this theory, appeared a footnote by Mr. Dixon, Government Veterinary Surgeon, stating that, in his opinion, the doses administered were much too large—dangerous, in fact, for even adult birds.

To say that I was surprised at such an opinion, and from such a source, would hardly be expressing myself adequately.

I have tested bluestone very thoroughly as a cure and preventive for wireworm in ostriches. I have dosed birds of all ages, from three months upwards, and in all conditions, some cures being effected where birds were too thin and weak to stand on their legs. I have recommended the dose to friends, who have tried it on their birds with similar beneficial results, and only recently I received a letter from a gentleman (who, by the way, is one of the most experienced and

prominent ostrich farmers in the Cape Province), stating that he had dosed some valuable young birds with bluestone in the quantities I prescribed, and that he considered their lives were thereby saved. Here is an extract from the letter referred to: "For my part, I thank you greatly for having drawn my serious attention to the efficacy and reliability of bluestone in cases of wireworm in ostriches. I have dosed some valuable young birds (about ten months old) as advised by you, and after three doses I ascribe the saving of their lives to the dosing with bluestone." After giving other details of what is undoubtedly a successful experiment with the remedy, the gentleman concluded his letter with the following: "I shall use no other than the bluestone dose, as used by you, and subject to all precautions necessary."

Since we have such strong evidence on the merits and absolute safety of the drug, it will be asked, what was then the real cause of Mr. Allrish's losses? My reply is, obviously the combination with paraffin, which was administered only three hours instead of at least as many days before the bluestone, and following, as it did, a severe fast of some fourteen hours' duration.

It was a fatal mistake. Paraffin is a superfluity, generally an injurious superfluity, and certainly a poison when used in direct contact with other drugs.

The birds themselves resent it more than anything. It invariably puts them off their food for days, whereas bluestone has an exactly opposite effect, causing them to seek and devour food from the moment they are released.

In conclusion I would add that, as I had not mentioned dosing with paraffin in any previous correspondence, it should certainly not have been in any way connected with the true remedy which I advocated.—Yours, etc.,

W. C. GOULD.

Petworth, District Alexandria, Cape Province.

MANURE AND LIME.

To the EDITOR of the *Agricultural Journal.*

SIR,—You would oblige me by inserting the following in your journal. I wish to inform you that I have a piece of "dune" soil, and, being unacquainted with such ground, not having been here for a long time, I have had much trouble in cultivating same. Nobody has yet tried to plant black wattle (which thrives well on moist ground), paspalum, or rape. When I saw in the *Agricultural Journal* manure being recommended I also tried it, but some parts became brackish on account of it. Now I wish to recommend slaked lime as a good manure. I have added one-third lime to good manure, and have used two bags for one acre. Now, I should like to know if somebody else, who could give me further information has ever worked upon such ground.—Yours, etc.,

G. J. VERMAAK (F.'s son).

Erfpach, P.O. Albertina, Riversdale District, Cape Province,
24th February, 1911.

LEAKAGES IN EARTHEN DAMS.

To the EDITOR of the *Agricultural Journal.*

SIR,—I notice in your February issue a letter by Mr. M. A. Blanckenberg replying to an inquiry by Mr. A. W. Adams *re* the building of staunch dams, and, having had a little experience in this line, perhaps some of your readers would be interested to know how I overcame this trouble.

I should say that the information furnished by Mr. Blanckenberg is most valuable indeed. Some of your readers are no doubt acquainted with the nature of our soils on the northern slopes of the Magaliesberg, being of a sandy loam and highly porous, when a dam newly made will take some considerable time to fill before being waterproof. After completing my dam I turned water in it to allow it to fill, which took thirteen days. After stopping the water, in about thirty hours it had all percolated through the bottom. The dam walls showed no indication of leakage. To have this leakage stopped I adopted the following method:—I obtained some alluvial soil washed from the mountain, and this I spread over the bottom of the dam about three inches thick, then had it dug over to a depth of about nine or ten inches and mixed well together and levelled roughly. After turning the water in, it took about twenty to twenty-four hours to fill, and on stopping the inflow I found my dam perfectly waterproof.—Yours, etc.,

J. M. BAIKIE.

P.O. Kroondal, Rustenburg, Transvaal.

A NEW COTTON HARVESTER.

To the EDITOR of the *Agricultural Journal.*

SIR,—In your February issue is an article on "Cotton Cultivation and Prospects in the Transvaal", by Mr. T. A. J. Place, in which mention is made of a cotton harvester which has been invented in the United States of America. I enclose a description of another harvester which has been tried and proved successful.—Yours, etc.,

H. WILSON.

P.O. Carolina, Transvaal.

[The description referred to by Mr. Wilson is taken from the *Sunday Chronicle* of the 22nd January, 1911. After drawing attention to the magnitude of the world's cotton crop, which, in the United States alone, amounted to 5,464,597,000 lb., the writer proceeds: "The usual method of picking cotton is by hand. Negroes principally go over the cotton fields, staggering with the weight of the sack they are filling. They pluck the creamy-looking cotton from the burst boll, but they have to pluck cotton from 200 of the bolls (or pods) before they have collected one pound. The task of collecting a cotton crop which consists of 1,142 billion bolls can, therefore, be appreciated.

"Unfortunately, however, there is often a scarcity of labour, and for many years there have been lamentations that while nearly every other crop can be gathered by machinery, cotton, which is such a force in the world, can only be picked by hand.

"It is to remedy this that the Price-Campbell cotton-picker has arrived, and this week the members of the Liverpool Cotton Association were afforded an opportunity of seeing it at work for the first time in Europe.

"It is not a pretty machine. It resembles a young traction engine more than anything else, but when you come to look inside the complicated machinery is startling. Driven by petrol, it goes along at the rate of a man who is walking. Between the wheels is a space which has as a roof countless revolving pieces of steel, with teeth that act as fingers. These teeth come in contact with the cotton which has burst from the boll. The soft cotton becomes entwined around the little pieces of steel, and is thus collected, to be detached automatically and dropped into o e of the two bags behind. The stalks are left intact, and any flowers which happen to be in the way are disregarded by the active fingers of the machine. . . .

"The achievement of the inventor is certainly a remarkable one, and it is calculated that it does the work formerly performed by fifty men.

"But as cotton picking takes place only for a very short period during the year, the inventor has adapted the machine to other uses when it is necessary. It can act in conjunction with a plough, it can do the work of a pruner, a harrow, and a stalk cutter, or it can even be used as a stationary engine for any purpose required by the farmer."]

STEENBOK ZUURING.

To the EDITOR of the *Agricultural Journal.*

SIR,—Having read in the *Cape Agricultural Journal* of December, 1907, about the application of lime as a preventive against the growth of steenbok-zuuring or sorrel, I immediately proceeded to try it. We have a large amount of this sorrel, which is quite choking our lucerne.

The area on which I tried the remedy was 300 square feet, and the amount of lime applied about 10 lb. The experiment was made on the 23rd November last. After the lime had been applied the plot was well hoed, so as to cut down the weed and at the same time work the lime into the soil.

On the 15th February of this year I examined the plot and found only one or two weeds, whereas in the check plot alongside, which was not treated with lime, there was an abundance of this sorrel.

Hoping this may be of interest to your readers.—Yours, etc.,

C. L. P.

Newlands, Capetown.

A CHEAP PAINT.

To the EDITOR of the *Agricultural Journal.*

SIR,—The following recipe was given me by an old and well-known farmer of Fish River Rand, and I am sending it to you to publish or not as you see fit:—

Take 10 gallons of stockholm tar (for iron, coal tar may be substituted), 5 lb. of pitch, and a small proportion of fat or oil to make it run nicely when applying. Melt well together.—Yours, etc.,

A. E. CUNNINGHAM.

Sea View, P.O. Trappe's Valley.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

LOOSE TEETH IN CATTLE.

About two years ago I bought an ox suffering with loose teeth, and they are still loose. The ox is always in poor condition. Will you kindly tell me what you think of this case, and what I might try as a cure?—M. HEYNS, P.O. Blackhill, District Middelburg, Transvaal.

Answer.—It is possible that the loose teeth are due to the very poor condition of the animal, and every effort should be made to get him into condition. Plenty of soft, easily digested food should be given, as bran mashes, bran and linseed, etc. Boiling water should be poured over sufficient bran till the whole is melted, when it should be allowed to stand for half an hour or so covered with a bag, etc. Then mix a handful of salt with the mash. If linseed can be obtained, boil till the seeds burst and form a jelly, and add to each mash about a breakfastcupful of this jelly. For local treatment, use a mouth wash made by adding a teaspoonful of alum and some Condy's fluid to a pint of warm water. Pour this into the mouth, a little at a time, and let the animal put it out again.—A. MATTHEW, Government Veterinary Surgeon, Capetown.

Will you kindly let me know what is the cause of loose teeth amongst cattle, especially cows? Some say it is caused by the grass veld, but my cattle mostly pasture on prickly pears. Please also tell me the best remedy. I have been rubbing salt on the teeth, but it does not seem to do much good.—I. J. HAARHOFF, Uitkomst, Graaff-Reinet, Cape Province.

Answer.—Loose teeth in cattle are generally due to a low state of health of the animals. They ought to get some soft food which is easily eaten and digested, such as bran mashes (made by letting bran steep in boiling water for half an hour, and then adding some salt before feeding it to the cattle); or bran mash with a little boiled linseed added to it, boiled mangels, etc. A mouth wash might be used in the worst cases. To a pint of warm water add a teaspoonful of alum and a little Condy's fluid, and pour this into the animal's mouth, a little at a time, allowing it to come out again.—A. MATTHEW, Government Veterinary Surgeon, Capetown.

EYE TROUBLE IN CATTLE.

I would be much obliged for information on the following:—I have about seventy mixed cattle, and I find, especially amongst the young stock, something wrong with their eyes. The eyes begin to water (one at a time), and in about a day and a half a white coating

appears over the whole eye, which often gets red in bad cases. They seem to suffer for about a week or more, and then the eye begins gradually to clear, but very slowly. The eye clears sufficiently to allow the animal to see, but some of the coating is left behind. About twelve or fifteen of my cattle had the trouble, and some more have it at the present time. Could you tell me what causes it, and what is a preventive or cure for it?—J. MONTGOMERY, Witbank, P.O. Ermelo, Transvaal.

Answer.—Your cattle are evidently suffering from specific ophthalmia, a contagious inflammation of the structures of the eye, which, if not properly attended to, leads to cataract, and in some cases total loss of sight. As the disease is a contagious one, the first step in treatment is to isolate the afflicted animal. Light has a tendency to irritate the inflamed structures. The animal should, therefore, either be kept in a clean, well-ventilated, dark stable or shed, or have a shade put over the eye or eyes, as the case may be, namely, if one or both eyes are attacked. This can be done by placing an ordinary halter on the animal and attaching a piece of cloth or calico to it so as to cover one or both eyes. The affected eye should then be syringed out twice a day with a nitrate of silver solution; strength, 5 grains to an ounce of water. Get a chemist to make up the solution, and use a glass syringe.—J. M. CHRISTY, Assistant Principal Veterinary Surgeon, Transvaal.

A number of my cows and calves have had eye trouble during the drought, the pupil of the eye becoming quite white, and the animals being for three weeks totally blind. I will be glad to know remedy for same.—HODGSON B. THOMPSON, Gras Pan, Border Siding.

Answer.—The cows and calves were probably suffering from specific ophthalmia, a contagious form of inflammation of the eye. As to treatment, isolate the affected animals and put a shade over the eye or eyes, according as one or both are attacked. In the early stages blow a little calomel twice a day into the affected eye or eyes, in the later stages syringe them out twice a day with a watery solution of nitrate of silver; strength, 5 grains to an ounce of water. Get a chemist to make up the solution, and use a glass syringe.—J. M. CHRISTY, Assistant Principal Veterinary Surgeon, Transvaal.

OBSTRUCTION IN COW'S TEAT.

After one of my cows had calved I discovered a hard, sinewy substance in one of the teats, which blocked the passage of the milk. I shall feel much obliged if you can suggest any method whereby I may be able to get rid of this and get the teat into its normal condition again. The cow calved last November.—V. GOLDSWORTHY, Seymour, Stockenstroom.

Answer.—This is rather a common occurrence, and one very difficult to deal with satisfactorily. I would suggest that you get a teat syphon and use it to draw off the milk. The syphon should be placed for a few minutes after using in boiling water to thoroughly disinfect and cleanse it.—J. M. CHRISTY, Assistant Principal Veterinary Surgeon, Transvaal.

SWELLING IN LEGS OF CALVES.

I would be extremely obliged if you could inform me as to the cause of, and also of a cure for, swellings in the legs of calves. I have up to the present had two cases, both calves being very young. In the first case the front legs were swollen in the upper portion. In the early stages the calf could get up with difficulty; in the course of a day or two it could only stand with great difficulty when assisted. It would suck from its mother, but not greedily. The affected parts were painful to the touch, and from the feel appeared to have small air bubbles inside, or something of the sort. The calf lived for about seven days after it was noticed to be ill. In the second case the calf has been bad now for three days. It is swollen in the front knee only, which appears very painful when touched. The swelling is getting softer, but up to the present there is no sign of air bubbles. It drinks when assisted to stand. It appears to be lame in one of the hind legs, but there is no sign of swelling.—C. A. NORTHCROFT, Cloetedale, Tylden.

Answer.—There is no doubt the calves are infected with the disease commonly known as joint ill or navel ill. Through some debilitating influence, the healing and closure of the navel is retarded, the part is infected by a specific microbe before it is closed, and finding its way into the blood stream is distributed to various parts of the system, particularly selecting the joints, but the liver and other organs may be involved where it sets up inflammation. In addition to this local effect there is the production of debilitating fever and other systematic effects. It is contagious, and may be conveyed to other animals by an infected one. Treatment is preventive only. Curative measures are not very hopeful when once the poison has entered the system. Attention should first be given to the navel, and unhealthy matter removed and the part thoroughly cleaned and dressed with a disinfectant, a weak solution of Jeyes fluid, and if any secondary swellings or abscesses occur in non-essential parts of the body, these should be opened, cleaned, and disinfected in a similar manner. Preventive measures consist in being careful not to introduce an infected animal into a flock or herd, and in the prompt isolation of and thorough destruction or disinfection of all bedding, etc. All young animals that have come in contact with an infected one should have their navels cleaned out and dressed with the disinfectant. The same should be done to all calves when born, and the cord tied with string which has been dipped in the disinfectant. Great care should be exercised by those who dress the infected animal to disinfect their hands and clothes before coming again in contact with healthy animals.—E. FERN, Government Veterinary Surgeon, Capetown.

"GEEL DIKKOP" IN SHEEP.

Could you give me any information as to how to treat "geel dikkop" in sheep, and how to prevent it. For two months past I have had six to eight cases almost daily. I have been scarifying swollen parts, head, ears, and mouth, rubbing salt in the cuts to keep them open for the fluid to run out. Most of the cases have been cured of the actual disease, but I find most of the patients scratch the

treated parts to such an extent, as soon as they are on the veld again, that they will not heal. I may add that, almost without exception, the cases are amongst lambs of about nine months old.—E. A. ANSLEY, Reddersfontein, P.O. Immigrant, Orange Free State.

Answer.—"Geel Dikkop" in sheep seems to be due to some plants growing on the veld at certain times, and the first thing to do is to change the sheep on to new pastures, preferably to higher lands, even for fifteen days or so, when they can be brought back with safety generally. When cases occur give at once four ounces of Epsom salts in water. Scarify the swellings (except on the ears) and bathe the head with hot water and Jeyes fluid, keeping the head of the lamb over the steam meantime. This might be done the next day again. If the sheep get a salt lick, a little finely powdered sulphate of iron could be sprinkled over the salt rock as a tonic.—A. MATTHEW, Government Veterinary Surgeon, Capetown.

BLOAT IN GOATS.

I shall be very glad if you can inform me as to what remedy to use for bloat in goats, especially Angora goats. I often have cases among my goats, the animals becoming inflated and dying. I have tried many remedies, but without avail. When they become inflated they live for an hour to an hour and a half.—FRED. OOSTHUIZEN, Freyensfontein, Aberde n.

Answer.—I would advise administering the following mixture as soon as the animal is found to be affected:—Take aromatic spirits of ammonia, 10 ounces; spirits of nitrous ether, 4 ounces; solution of aloes, 2 ounces; and mix together, making a 16 oz. bottle of medicine. *Dose*: Two tablespoonfuls in about a pint of water. If the animal is very badly blown up, it is best to use the trocar and canula at once, and also give a dose of this medicine. The trocar and canula (the piercing instrument) is inserted downwards and inwards at the most prominent part of the swelling; the trocar is withdrawn, and the hollow canula left in till all the gas has escaped. The instrument can be procured from Messrs. Meyer, Meltzer & Co., Strand Street, Capetown.—A. MATTHEW, Government Veterinary Surgeon, Capetown.

TICK-INFESTED HORSE.

A young horse which is kept in the stable most of the time and cleaned regularly, has been badly infested with ticks ever since the beginning of the summer. I washed him several times with tobacco water, but he cannot get rid of them. What would you advise as a remedy?—M. HEYNS, P.O. Blackhill, District Middelburg, Transvaal.

Answer.—Thoroughly spray the horse with any of the recognized dipping mixtures and wash afterwards with a brush and soap and the dipping liquid. See that he is well dried before returning to the stable, both by hand and by walking in the sun.—A. MATTHEW, Government Veterinary Surgeon, Capetown.

AFFECTION OF FOAL'S HEAD.

Could you advise me as to what to do in the following case?—On the 31st January one of my mares dropped a foal, which I could not find, the mare returning alone to the house. The following day I found the foal standing in a strong stream of water—I live on the banks of the Orange River. Upon taking it out of the water, I found it to be queer in its head. This it appears to be keeping continually on one side. It keeps turning round, and seems not to be able to see very well. It drinks well, and is in good health. I may mention here that the place where the mare dropped the foal was almost an hour distant from where I found it; consequently I do not think it was born so, otherwise it would not have been able to follow the mare to such a great distance, it being very weak at the time and moving about in such an uncertain way as not to be able to follow its mother. Somebody tells me that the water was the cause of it, the foal having stood gazing in the water for a whole day in the warm sunshine, and that the reflection of the water impaired its sight, and that this is the reason of its keeping its head on one side.—P. VAN DER MERWE, Uizip, Upington.

Answer.—I think that in time this case will come all right. Meantime the mare and the foal must be kept in a camp or else watched continually so that the foal does not get lost or starve. Also you might rub both sides of the neck down the course of the backbone with the following:—Turpentine, 1 part; linseed oil, 5 parts; shaken up together. Use three or four days until the skin is blistered, then stop for a few days and rub again if necessary later on. —A. MATTHEW, Government Veterinary Surgeon, Capetown.

BUTTER-MAKING.

Will you kindly inform me of the best known method for preserving butter made on the farm now and to be used during the winter months when I cease milking native cattle that are running with a good bull? If you prefer the brine as a preservative, what strength should it be made, and how often changed; and if the salting is to be done in layers, please tell me what quantities. Last season I preserved in salt, and towards the end some of the butter went rancid.—ROBT. W. TWILLEY, Private Bag, Gwelo.

Answer.—You may use either brine or salt for the preserving of butter. In using brine the strength should be a saturated solution, i.e. dissolve in any quantity of water as much salt as possible without leaving any dissolved residue. It is not necessary to change the solution very often. Salting the butter in layers I presume to be the making up of the butter into packets, which, however, does not seem very suitable. If the butter is well made, dry salted, and well worked, the whole quantity could be packed in a jar or a similar receptacle, and the butter being then covered with a layer of salt or paper. It is, however, not always possible to prevent quantities of butter from turning rancid, unless it is thoroughly prepared.—S. F. NAUDE, for Superintendent of Dairying.

STABLING HORSES AND CALVES TOGETHER.—STUD-BOOK FOR PIGS.

Will you please tell me whether keeping horses and calves in one stable together will do harm to any of them? Also I would be glad to know whether there is a stud-book for pigs.—H. MULLER, Nil Desperandum, P.O. Bergplaats, via Piet Retief.

Answer.—I would not advise keeping horses and calves in the same stable. It is a slovenly way of doing things; further, the horses are liable to kick the calves and injure them. (2) There is no special stud-book for pigs in this country, but they can be registered in the South African Stud-Book (a work including all farm animals) on application to the local secretary, Mr. L. Hatch, Agricultural Department, Pretoria.—J. M. CHRISTY, Assistant Principal Veterinary Surgeon, Transvaal.

THE LABORATORY DIP.

Will you kindly furnish us with full particulars as to the preparation of the Laboratory Dip, i.e. ingredients, manner of preparing, and quantities required per hundred gallons of water?—VICE & BROSTER, Sipton Manor, Fort Beaufort, Cape Province

Answer.—To mix 400 gallons, the following quantities of arsenite of soda, soft soap, and paraffin are required:—8½ lb. arsenite of soda, 5½ lb. soft soap, and 2 gallons paraffin. The details for preparation are as follows:—Dissolve the soap in about five gallons of hot water; while still hot add this soap solution in small quantities at a time to the paraffin and beat or stir to a creamy lather. This makes the soap emulsion. Dissolve 8½ lb. of arsenite of soda in a sufficient quantity (about a gallon) of hot water, and when completely dissolved add cold water up to 50 gallons This mixture can be made in the tank. The soap solution may then be gradually added, stirring thoroughly the while. Water should then be added till the 400-gallon tank is full. When it is desired to fill the dipping tank the above procedure can be adopted for as many times as is found necessary, or one mixing may be made sufficient for the purpose. Four hundred gallons, however, is a sufficient quantity to handle at one time. If a film of oil floats to the top of the dip in the tank the dip should be stirred with a stick or board before commencing to dip, or the oil may easily be removed by skimming, the proportion of alkali present in the soft soap (a proportion varying with different samples) determining to some extent the degree of emulsification of the oil. It is of great importance that arsenite of soda containing 80 per cent. arsenic should be used, as it has been found in the past that several failures have been experienced in the application of this dip by the use of unreliable arsenical preparations. Hard water should not be used in the mixing of the dip. The above instructions should be strictly adhered to when mixing. In the case of cattle not habituated to an arsenical dip, slight excoriation of the skin of the thighs and neck, etc., may be produced after the first dippings, but should this difficulty arise, a dressing of the affected parts with oil or lard before dipping will permit of the animals being dipped at the five-day interval. It will be found that this intolerance rapidly disappears.—EDITOR, *Agricultural Journal.*

MAIZE SILAGE.

How long will maize silage keep good after being taken from the pit? I have dug two good pits and intend filling same for my own use, but I would like to know, before doing a third, if the silage is a marketable fodder when taken out, or will it too quickly decompose if bagged and baled for sale? Would whole or chopped stalks be better for this purpose?—RUPERT YEATMAN, P.O. Box 10, Middelburg.

Answer.—The marketing of silage is quite an impracticable proposition. For sale purposes baled stover is best. For this purpose the stalks should be cut before the ears are fully ripe, i.e. when about half the leaf remains still green. This can be baled whole or cut up (shredded); the latter form is the most palatable and economical. A combined machine to husk and shell the ears and shred the stalks and leaves is on the market, and does excellent work. Some South African farmers are baling this shredded stover and putting it on the market to advantage.—J. BURTT-DAVY, Government Agrostologist and Botanist.

BULRUSH MILLET.

Will you kindly inform me whether there is a sale for bulrush millet grain in quantity either in South Africa or in Great Britain, and what is the commercial value of same per ton at the present time? I have been very successful in the cultivation of the same, and if only I could find a market for a quantity there are many others who would go in for the cultivation of this grain.—"BLUEBIRD", P.O. Umtwalumi, Natal.

Answer.—The present market for munga millet grain is somewhat restricted owing primarily to lack of a constant supply. Local seedsmen are always prepared to secure South African seed so far as their requirements go, which are somewhat limited. As munga millet would take the place of maize in the rotation of crops, and has many points of similarity, a comparison may well be made between the two. The value of the grain as a food is about equal to that of maize, the respective analyses being as under:—

	Water.	Protein.	Carbohydrates.	Fat.
Millet seed	11.80	10.13	71.75	4.69
Maize grain (dent) ...	11.56	10.26	69.63	4.93

It will be seen that though the maize is slightly richer in proteins and fat, the millet has the advantage in carbohydrates. Any development of the present market would be at a price on a par with the present market for maize, and would probably be found among poultry keepers and the like, owing to its suitability for feeding to young chickens and poultry. However, I do not anticipate that munga millet will be found a more profitable crop than maize when grown for grain, as the cost of harvesting is considerably heavier, and the yield no better. One of the greatest difficulties attaching to the preparation of munga seed for market lies in the persistent manner in which the seed is attached to the husk. As a silage crop this millet probably cannot be excelled, and during the current season some 250

tons of silage have been secured at Cedara from eighteen acres, some of which was cut sufficiently early to enable a subsequent seed crop to be harvested.—W. C. MITCHELL, Farm Manager, Central Experiment Farm, Cedara, Natal.

WOOD ASHES FOR POTATOES.

I have a large quantity of wood ashes mixed with nodules of charcoal obtained from a bake oven; the wood used for firing the oven has been principally thorn wood. I would be glad to know what use as a fertilizer this ash could be put to; would it be of benefit in growing potatoes?—WILL HOGG, Great Kei Drift, P.O. Bolo, Cape Province.

Answer.—If the ashes are sifted from the charcoal they would form a fertilizer of considerable value for potatoes, but would not be entirely effective alone.—EDITOR, *Agricultural Journal.*

Notes on the Weather of January, 1911.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

PRACTICALLY normal mean pressure; temperature slightly higher than the normal owing to unusually warm nights; cool, cloudy, and showery weather during the first half of the month followed by hot and scorching days during the latter portion of the month; moderately cloudy skies with fairly frequent fogs and mists; several widespread thunderstorms; some destructive hailstorms; a depth of rainfall one-quarter greater than usual, but deficient over several divisions, particularly Bechuanaland; some strong winds; such were the leading features of the weather of January, 1911.

Precipitation.—The mean rainfall, based on the returns from 454 stations (155 being in the Orange Free State), amounted to 3·03 inches on seven days, being 0·56 inches or 23 per cent. more than usual. This amount is 1·26 inches more than last month and 0·76 inches in

Division.	Mean Rainfall (1911).	Mean No. of Days.	Average Rainfall (1891–1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	1·90	5	1·24	4	+ 0·66	+ 53
South-west	0·58	4	0·79	3	— 0·21	— 27
West Coast	0·65	3	0·27	1	+ 0·38	+ 141
South Coast	4·36	11	1·93	7	+ 2·43	+ 126
Southern Karoo ...	1·96	6	0·51	2	+ 1·45	+ 284
West Central Karoo	1·66	3	0·87	3	+ 0·79	+ 91
East Central Karoo	2·55	5	1·90	5	+ 0·65	+ 34
Northern Karoo ...	1·84	5	1·65	4	+ 0·29	+ 18
Northern Border ...	2·01	4	2·04	5	— 0·03	— 1
South-east	4·68	10	3·48	9	+ 1·20	+ 34
North-east	3·12	7	3·75	8	— 0·63	— 17
Kaffraria	5·47	13	4·36	11	+ 1·11	+ 25
Basutoland	4·18	10	5·20	12	— 1·12	— 22
Orange Free State ...	3·08	6	3·16	7	— 0·08	— 3
Durban (Natal) ...			5·12	...		
Bechuanaland ...	2·12	5	3·93	8	— 1·81	— 46
Rhodesia	10·69	19	5·88	12	+ 4·81	+ 82

excess of the mean for January, 1910. The accompanying table shows that an excess of precipitation was common to ten out of sixteen divisions, the surplus amounts being greatest over the West Coast, South Coast, and Southern Karoo, where the excess ranged from 126 to 284 per cent. over and above the usual amounts; the excesses elsewhere varied between 91 per cent. over the West Central Karoo and 18 per cent. over the Northern Karoo. Deficiencies in the amounts recorded were confined to the South-west, Northern Border, North-east, Basutoland, Orange Free State, and Bechuanaland, ranging from 46 per cent. over the last to 1 per cent. over the Northern Border, the Orange Free State having only 3 per cent. less than usual. The best watered areas were Rhodesia, Kaffraria, South-east, South Coast, and Basutoland. Of these 454 stations, only 4 had *nil*, and 29 had 0·01–0·50 inch; 52 had 0·51–1·00 inch; 109 had 1·01–2 inches; 108 had 2·01–3 inches; 65 had 3·01–4 inches; 44 had 4·01–5 inches; 12 had 5·01–6 inches, and an equal number had 6·01–7 inches; 6 had 7·01–8 inches; and 4 each had 8·01–9 inches, 9·01–10 inches, and 10·01–11 inches; the largest quantity recorded during the month being 13·99 inches at Evelyn Valley, the next greatest amount being 10·98 inches at Kentani. In the Orange Free State the largest amount was 8·03 inches at Christofera, in the District of Harrismith, and the smallest, 0·43 inches, at Burnet Holm, in the Winburg District. Analysing the maxima in 24 hours at 292 stations for which such information is available, it is found that 60 had *nil* to 0·50 inch; 93 had 0·51–1 inch; 113 had 1·01–2 inches; 20 had 2·01–3 inches; 5 had 3·01–4 inches; the only station having more than 4 inches in any 24-hour period was Lemoenfontein (Beaufort West District), where 5·75 inches were registered on the 29th, the next heaviest fall being 3·56 inches at Storms River on the 28th. The number of *thunderstorms* reported—354 on 27 days—was one-third more than last month, but less than two-thirds the number noted during the corresponding month of last year; these were mostly local except on 2nd, 6th, 17th, and 30th,

when large areas were affected more particularly on the 2nd and 6th. *Hail* was of more frequent occurrence than in December last, but less so than during the corresponding month of last year, thirty-nine instances being noted on sixteen days, particularly on the 2nd and 6th. Storms of this nature wrought considerable damage in some parts of the district round Kokstad, while on the 2nd, at Fort Beaufort, a local hailstorm completely destroyed all gardens, the outskirts of the town not being affected; 0·35 inch fell there from 4–4.15 p.m. Some particularly heavy falls were registered during some of these storms, e.g. at Ryedale (District Aberdeen) on the 6th there occurred what is described as a "terrific hailstorm with sheets of rain", when 1·30 inches of rain was recorded between 3 and 3.20 p.m., or at the rate of 3·90 inches per hour; again, at Lemoenfontein (District Beaufort West), during a storm of rain, hail, and wind, 5·73 inches were registered between 4 and 7.30 p.m., a rate of 1·74 inches per hour for three and a half hours; and at Jamestown (District Aliwal North) on the 31st, 2·75 inches fell during a "terrific hailstorm (which) lasted about half an hour; (with) heavy rain for a short time." No *snow* or *sleet*.

Temperature, Cloud, and Wind.—The mean temperature of all stations was 69°·7 or 2° warmer than last month and 0°·8 warmer than in January of the previous year. The mean maximum (79°·8) was 0°·9 warmer than in December, and 1° higher than in January, 1910; and the mean minimum (59°·5) was 3°·1 higher than in the previous month, and 0°·5 higher than during the corresponding month of last year. If the stations in the Orange Free State be included in estimating the mean, the mean monthly temperature of all stations is found to be 69°·5, the mean maximum being 80° and the mean minimum 59°; the difference being due to the stations, there being on the mean 0°·9 warmer during the day and 2°·9 cooler during night than the mean of those in the Cape Colony. Compared with the normals the mean temperature of the month was 0°·3 warmer than usual, the days being 0°·1 less and the nights 0°·6 more than usual. The mean daily range was 20°·3. The individual stations show considerable diversity in relation to the normals, but, speaking generally, it may be said that the mean monthly temperatures were above the average in the east and north and portions of the south and west by amounts varying from a few tenths to two degrees, and below the normal elsewhere by a few tenths to more than one degree. The excesses varied from 0°·2 at Sydney's Hope to 2°·1 at Port St. John's, while the deficits ranged from 0°·1 at Kingwilliamstown to 1°·6 at Bishopscourt, in the Cape Peninsula. At Bloemfontein and Hopefountain the mean monthly temperature was practically normal. This diversity in the signs of the departures from the normals is most apparent in the mean day temperatures which were generally higher than usual over the same areas as were noted in connection with the monthly temperatures, the excesses ranging from 3°·7 at Queenstown to 0°·3 at Umtata; the deficits at the other stations varied from 3°·2 at Bishopscourt to 0°·1 at O'okiep. At most of the South Coast stations, at Hanover, and a few places in the South-east and North-east, the mean minima were lower than usual by amounts varying from 0°·1 at Cape Agulhas to 2°·5 at Port Elizabeth, but at the majority of places the nights were warmer than usual by 1–2°, but rising to 3°·6 at Port St John's. At Hopefountain and Bloemfontein the days were, respectively, 3°·1 and 0°·9 cooler, and the nights 2°·9 and 0°·7 warmer than usual. The mean warmest station was Kimberley (77°·8), and the mean coolest, Evelyn Valley (64°), a difference of 13°·8. The highest temperatures during the month were most commonly registered between the 26th and 30th, but were also noted on 1st to 4th, 8th, 16th to 19th, and 21st; and the lowest temperatures occurred most widely between 15th and 20th, more particularly on the 19th, but also on 2nd to 4th, 8th, 9th, 22nd to 24th, 27th and 28th, mostly at isolated stations. The means of these extreme readings were 91°·9 and 54°·3, the former being 0°·5 lower and the latter 4°·6 higher than the similar values for January, 1910, thus reducing the mean monthly range to 37°·6 as against 42°·7 last year. Temperatures of 100° and upwards were limited to five stations, the highest being 102° at Kimberley on 2nd and 27th. Extreme temperatures below 50° occurred at one-third of the Cape Province stations, the lowest reading being 44° at Hanover on the 18th. The extreme monthly range was therefore 58°. No *frost* was reported this month. At Retreat, in the Cape Peninsula, the mean minimum temperature on grass was 56°·5 or 4°·3 lower than the shade minimum, and 1°·9 higher than in January of last year, the extreme readings being 45°·1 on 19th and 65° on 27th. The early part of the month was generally cloudy, and relatively cool with some good showers, the beneficial effects of which were nullified by intensely hot days in the latter part of the month, drying up and withering the veld and, together with strong winds, seriously affecting the fruit crops in the West. Fairly satisfactory crops are, however, reported to have been harvested in the Albert and Cathcart districts and abundance of fruit in the Sterkstroom division. The mean percentage of *cloud* was 48 or 9 per cent. more than last month and 5 per cent. more than in January of last year: it was fairly uniform in distribution over the various sections, being mostly between 40 and 50 per cent., but rising to 57 per cent. in the South-east and 53 per cent. over Kaffraria and falling to 19 per cent. at Mochudi and 21 per cent. at O'okiep. The skies were most obscured at Hopefountain (Rhodesia), where the mean amount was 94 per cent.; at this station the morning sky was completely overcast on twenty-two days, rain falling on nineteen. The next cloudiest station was Stutterheim with 76 per cent. *Fogs* and *mists* were much more numerous than last month and just the same as in

January of last year, 135 instances being reported on twenty-eight days mostly from 1st to 9th and on 21st, 22nd, 25th, and 29th. The prevalent *winds* were south-westerly in the West, and at Kimberley south-south-easterly over the Cape Peninsula and the South-west, westerly all along the Coast, and easterly (NE. to SE.) over practically the rest of the Province. The mean *force* on the Beaufort Scale was 1·88, corresponding to a mean velocity of 7·6 miles per hour, or 0·5 mile per hour less than last month and 0·7 mile per hour less than the previous January. These morning winds were strongest over the Cape Peninsula. The Royal Observatory records show a 15 per cent. excess of SSE. winds and a small excess of 5 per cent. of those from NNW., but a decrease of those from all other points of the compass, more particularly of those from due south which were 10 per cent. less than usual. The mean morning velocity there was 7·5 miles per hour, or 0·1 mile per hour more than usual. *Gales* and strong winds were more frequent than usual, twenty-five being reported on nine days, particularly on the 17th, when a violent NW. to SW. wind caused considerable damage to fruit crops in the Drakenstein district. Four *hot winds* on three days and two *duststorms* on the 17th were noted during the month.

At the Royal Observatory the mean barometric pressure for the month was 29·95 inches, practically the same as usual.

TEMPERATURE.

Division.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory	78·1	61·6	69·8	92·2	29th	54·5	19th
Capetown (City Hospital) ...	78·8	60·1	69·4	90·6	4th	54·0	15th
Bishopscourt	74·0	57·5	65·8	84·0	26th	49·0	19th
Wynberg	77·2	60·3	68·8	84·2	16th	55·0	8th
Groot Constantia	75·0	60·3	67·6	88·0	30th	54·0	18th
Retreat	77·4	60·8	69·1	84·5	29th	49·2	19th
Elsenburg Agricultural College	80·5	58·3	69·4	92·8	26th	51·1	22nd
Robertson (Experimental Stn.)	83·1	68·3	75·7	95·0	16th	61·0	19th
Groot Drakenstein	83·6	59·4	71·5	98·4	26th	47·3	19th
Danger Point	73·0	61·9	67·4	78·0	21st	56·0	2nd
O'okiep	83·4	57·8	70·6	99·0	26th	47·0	18th
George (Plantation) ...	74·0	58·0	66·0	85·0	1st	52·0	19th
Mossel Bay	76·7	61·3	69·0	91·0	28th	45·0	28th
Port Elizabeth	75·7	62·8	69·2	84·0	1st & 8th	56·0	19th
Cape St. Francis	73·4	64·6	69·0	78·0	27th	57·0	16th & 20th
Storm's River	75·0	57·6	66·3	85·0	1st	51·4	19th
Heidelberg	82·1	59·7	70·9	97·0	1st	50·0	19th & 20th
Cape Agulhas	73·6	62·8	68·2	79·0	17th	57·0	19th
Amalienstein	85·7	59·2	72·4	96·0	26th	50·0	19th & 20th
Murraysburg	86·5	57·6	72·0	100·0	27th	49·0	17th
Hanover	84·1	52·8	68·4	98·0	28th	44·0	18th
Kimberley	92·8	62·9	77·8	102·0	2nd & 27th	52·1	18th
Kingwilliamstown	82·9	61·7	72·3	101·0	3rd	55·0	3rd
Bedford	81·2	57·5	69·4	101·0	27th	49·0	19th
Stutterheim	79·4	57·9	68·6	92·4	27th	49·8	19th
Sydney's Hope	77·4	58·2	67·8	92·0	2nd & 27th	51·0	19th
Cathcart	76·4	56·0	66·2	92·3	27th	47·9	19th
Evelyn Valley	75·0	53·0	64·0	95·0	18th	49·0	4th
Chiselhurst	84·1	61·2	72·6	93·0	2nd	55·0	18th
Aliwal North	85·8	56·0	70·9	95·0	27th	50·0	19th
Queenstown	84·7	58·0	71·4	100·0	27th	51·0	22nd
Umtata	79·9	61·0	70·4	99·0	17th	55·0	4th
Port St. John's	79·9	66·7	73·3	88·0	19th	60·0	23rd
Tabankulu	78·1	57·3	67·7	91·5	17th	50·0	19th
Kokstad	78·1	55·6	66·8	90·3	2nd	49·9	20th
Main	78·1	58·4	68·2	96·8	27th	51·5	19th
Teyateyaneng	84·0	54·2	69·1	92·0	28th	45·0	19th
Mochudi	88·7	64·3	76·5	98·0	26th	58·0	24th & 27th
Hopefountain	76·7	60·3	68·5	85·9	3rd	51·1	9th
Means	79·8	59·5	69·7	91·9	—	54·3	—
Extremes	—	—	—	102·0	2nd & 27th	44·0	18th

OBSERVERS' NOTES.

Vruchtbaar (*Wellington*).—The first two weeks in January we had nice cool nights with moderate sun during the day, but the latter part of the month burning days and hot nights was the rule. Grapes suffered greatly, and the output will be materially reduced by the excessive heat.

Uitenhage Park.—A very warm month, but good rains. Rainfall above the average, and only exceeded once during the past ten years.

Krom River (*Beaufort West*).—Drought; stock suffering; heavy losses.

Herschel.—Mealies (only crops) and kaffir corn promising.

Thibet Park (*Queenstown*).—Frightfully dry; looks almost like winter except that trees are in full foliage.

Theefontein (*Hanover*).—Winds variable; weather very disappointing, clouds of the petrified kind appearing every day. The 2·15 inches of rain spread over four days did practically no good, a very hot sun withering up the grass, etc., within a few days after each shower. Drought unbroken over a large part of district. Stock fair. Fruit abundant on most farms.

Sunnyside (*Hay*).—The weather for the month of January, 1911, has been most disappointing, the splendid rains of the 4th and 5th being followed by a long spell of scorchingly hot days; consequently the young veld has withered badly. All stock still declining in condition, though lamziekte has manifested itself amongst cattle, but up to now the losses incurred have not been severe.

Glencairn (*Cathcart*).—Harvesting about completed throughout the district; crops on the whole fairly good.

Clifton (*Sterkstroom*).—Month began well, but disappointing in end. Veld drying up. Stock doing fairly well. Plenty of fruit. Very little ploughing done.

Lyndene (*Albert*).—A good wheat harvest. Veld in good condition.

Armadillo Creek.—Following a nominal rainfall for December, drought serious, and mealie and kaffir corn crops are burnt up past recovery generally over Bechuanaland. The heat has been very trying.

Nottingham (*Mafeking*).—Our rainfall since October has been most disappointing. Although the veld is fair and stock in flourishing condition, the crops are a partial failure, and it is not to be expected that heavy yields will be secured in this district.

Groot Drakenstein.—Mean temperature of month $0^{\circ}\cdot7$ above the average ten years. Rainfall only 25 per cent. (about) of average for ten years. The storm on the 17th of the character of a tornado and the high SE. winds the last few days of the month did great damage to the fruit crop, especially pears. The Peach Fly has been unusually prevalent, in spite of the exceptionally dry weather.

Kokstad.—An unusually hot month, with less rain than our average. Hail has done considerable damage in some parts of the district.

Rainfall, January, 1911.

I. CAPE PENINSULA:	Inches.
Royal Observatory (a) 12-inch gauge	0·63
Capetown (Fire Station)	0·72
Do. (Molteno Reservoir	1·26
Do. (Platteklip)	1·54
Do. (Signal Hill)	0·95
Do. (Hospital)	0·74
Camps Bay	0·80
Table Mountain (Disa Head)	1·72
Do. (Kasteel Poort)	3·57
Do. (Waai Kopje)	4·38
Do. (St. Michael's)	4·57
Bishopscourt	1·13
Wynberg (St. Mary's)	1·32
Groot Constantia	2·13
Tokai Plantation	1·28
Muizenburg (St. Res.)	1·82
Do. (Cooper)	0·96
Cape Point	1·57
Robben Island	0·69
Maitland Cemetery	0·68
Lower Reservoir (Table Mountain)	1·24
Woodhead Dam (Table Mountain)	3·20
MacLears Beacon (Table Mountain)	4·41
Waai Vlei (Table Mountain)	3·95
Woodhead Tunnel	2·88
Tamboers Kloof	1·16
II. SOUTH-WEST:	
Eerste River	0·90
Klapmuts	0·68
Stellenbosch (Gaol)	0·59
Somerset West	0·95
Paarl	0·32
Wellington (Gaol)	0·81
Groot Drakenstein (Weltevreden)	0·49
Tulbagh	0·21
Kluitjes Kraal	0·31
Rawsonville	0·00
Caledon	1·11
Worcester (Gaol)	0·11
Karnmelks River	0·27
Lady Grey (Division Robertson)	0·19
Robertson (Gaol)	0·50
Do. (Govt. Plantation)	0·28
Montagu	0·00
Danger Point	1·15
Elgin Plantation	0·64
Elsenburg Agricultural College	0·82
Roskeen	2·02
Vruchtbaar	0·71
Waverley (Tulbagh)	0·44
Dwaars Rivers Hoek	1·05
Ceres	0·00
III. WEST COAST:	
Anenous	1·67
Klipfontein	1·56
Kraaifontein	1·07
O'okiep	0·84

III. WEST COAST (continued):	Inches.
Concordia (Krapohl)	1·05
Garies	0·38
Van Rhyns Dorp	0·06
Dassen Island	0·41
Kersefontein	0·30
The Towers	0·22
Malmesbury	0·22
Piquetberg	0·85
Wupperthal	0·07
Hopefield	0·24
IV. SOUTH COAST:	
Cape Agulhas	0·72
Swellendam	4·65
Heidelberg	1·59
Riversdale	1·85
Vogel Vlei	2·56
Mossel Bay	1·89
Great Brak River	4·53
George	6·45
George (Plantation)	6·74
Millwood	6·57
Plettenberg Bay	3·70
Harkerville	7·38
Lottering	4·41
Storms River	10·57
Witte Els Bosch	9·97
Humansdorp	6·93
Cape St. Francis	2·94
Uitenhage (Gaol)	3·09
Do. (Park)	2·67
Port Elizabeth (Harbour)	3·41
Do. (Victoria Park)	4·46
Do. (The Slip)	3·09
Sharks River (Nursery)	3·21
Centlivres	2·43
Potteberg	1·58
Edinburgh	5·97
V. SOUTHERN KAROO:	
Pietermeintjes	0·90
Ladismith	2·43
Amalienstein	2·26
Calitzdorp	3·49
Oudtshoorn	1·03
Uniondale	1·67
VI. WEST CENTRAL KAROO:	
Fraserburg Road	0·40
Prince Albert	0·72
Beaufort West (Gaol)	3·62
Dunedin	1·04
Nels Poort	0·30
Krom River	0·48
Roosplaats	0·49
Lemoenfontein	8·50
Vondeling (Willowmore)	0·85
Merweville	1·26
Baakens Rug	0·35
Willowmore	1·80
Steytlerville	2·12

VII. EAST CENTRAL KAROO:	*Inches.*
Aberdeen (Gaol)	2·25
Aberdeen Road	2·98
Klipplaat	1·66
Kendrew (Holmes)	1·72
Do.	1·55
Graaff-Reinet (Gaol)	2·52
Do. (Eng. Yard)	2·35
Roodebloem	1·87
Glen Harry	1·68
Jansenville	1·88
Roode Hoogte	4·89
Toegedacht	1·80
Klipfontein	3·15
Middlewater	2·63
Somerset East (Gaol)	4·63
Ryedale	3·22
Zeekoe River	1·71
VIII. NORTHERN KAROO:	
Sutherland	0·26
Fraserburg	0·54
Carnarvon	0·49
Brakfontein	0·66
Victoria West	1·20
Britstown	1·24
Wildebeestkooy	0·73
Murraysburg	0·65
De Kruis (Murraysburg)	2·06
Richmond	1·05
Hanover	1·71
Theefontein	2·15
Philipstown	3·67
The Willows (Middelburg)	2·01
Colesberg	2·60
Tafelberg Hall	2·52
Cradock (Gaol)	1·83
Witmoss	2·28
Varsch Vlei	3·43
Steynsburg (Gaol)	2·45
Tarkastad	2·09
Waverley	4·71
Schuilhoek	1·77
Vosburg	0·65
Thebus Waters	2·29
Rughtersfontein	3·68
Klipkraal	2·22
Esperanza	2·59
IX. NORTHERN BORDER:	
Kenhardt	1·05
Upington	1·56
Trooilapspan	2·01
Van Wyks Vlei	0·29
Prieska	1·91
New Year's Kraal	1·76
Karree Kloof	1·15
Douglas (Voss)	3·44
Hope Town	3·86
Newlands (Barkley West)	1·63
Barkley West	1·56
Kimberley (Gaol)	2·16
Do. Stepheus	2·91
Stoffkraal	2·00
Sunnyside (Hay)	2·20
Rocklands	3·03
Sydney-on-Vaal	2·22
Warrenton	1·45

X. SOUTH EAST:	*Inches.*
Melrose (Division Bedford)	2·94
Dagga Boer	3·88
Lynedoch	3·08
Alicedale	2·87
Cheviot Fells	2·28
Bedford (Gaol)	5·28
Cullendale	4·41
Adelaide	3·83
Atherstone	4·60
Alexandria	3·59
Fort Fordyce	4·66
Grahamstown (Gaol)	4·99
Sunnyside	4·26
Fort Beaufort	3·79
Katberg	6·60
Seymour	4·25
Glencairn	5·49
Port Alfred	3·52
Hogsback	8·76
Peddie	3·40
Keiskamma Hoek	6·37
Cathcart (Gaol)	3·86
Cathcart (Forman)	4·15
Cathcart	4·25
Thaba N'doda	7·34
Evelyn Valley	13.99
Crawley	2·96
Pirie Forest	7·84
Isidenge	6·48
Kologha	5·90
Kingwilliamstown (Gaol)	3·57
Do. (Pym)	4·56
Stutterheim	4·15
Fort Cunynghame	3·66
Dohne	4·33
Kubusie	5·63
Quacu	3·61
Blaney	2·00
Fort Jackson	2·93
Prospect Farm (Komgha)	1·80
Komgha (Gaol)	4·88
Chiselhurst	3·45
East London East	3·43
Cata	6·07
Wolf Ridge	9·08
Dontsah	5·62
Mount Coke	5·34
Albert Vale (near Bedford)	2·91
Insileni (Kingwilliamstown)	7·40
Woodlands (Fish River Rand)	2·61
Eastover	2·19
XI. NORTH EAST:	
Venterstad	3·44
Mooifontein	2·98
Burnley (Cyphergat)	4·48
Lyndene	4·76
Thibet Park	2·03
Sterkstroom (Station)	2·73
Aliwal North (Gaol)	3·32
Do. Do. (District Engineer)	2·55
Poplar Grove	1·55
Jamestown	4·55
Whittlesea	2·31
Queenstown (Gaol)	3·43
Do. (Beswick)	4·17
Dordrecht (District Engineer)	1·81

XI. NORTH EAST (*continued*):	*Inches.*
Herschel	4·45
Lady Grey	5·08
Lauriston	3·74
Lady Frere	2·99
Contest (near Bolotwa)	2·11
Keilands	2·62
Barkly East	3·44
Cliftonvale	3·14
Hughenden	3·01
Glenwallace	2·33
Indwe (Collieries)	3·63
Clifton (Sterkstroom)	1·96
Edendale	3·29
XII. KAFFRARIA:	
Ida (Xalanga)	2·84
Slaate (Xalanga)	2·27
Tsomo	2·52
N'qamakwe	3·55
Main	3·33
Engcobo	5·59
Butterworth	4·15
Woodcliff	9·12
Kentani	10·98
Maclear	4·59
Bazeya	9·34
Willowvale	8·90
Mount Fletcher	6·35
Somerville (Tsolo)	4·55
Elliotdale	7·48
Umtata	5·30
Tabankulu	4·70
Kokstad	3·30
Do. (The Willows)	4·08
Flagstaff	5·96

XII. KAFFRARIA (*continued*):	*Inches.*
Insikeni	6·22
Port St. Johns	6·70
Umzimkulu (Strachan)	4·91
Wanstead	6·38
Maclear (Station)	4·34
Lusikisiki	5·99
XIII. BASUTOLAND:	
Mohalies Hoek	2·85
Maseru	3·62
Teyateyaneng (Berea)	2·91
Qachas Nek	7·33
XV. NATAL.	
Umhlangeni (Lower Umzimkulu)	4·36
Winkel Spruit	2·73
Ottawa	2·50
Cedara (Vlei)	3·69
Cedara (Hill)	4·33
Giant's Castle	6·87
Weenen	4·79
XVII. BECHUANALAND:	
Taungs	1·54
Vryburg	1·50
Mafeking	2·45
Kuruman	4·26
Zwartlaagte	0·50
Nottingham	1·79
Masilibitsani	2·01
Armadillo Creek	2·01
Mochudi	3·02
XVIII. RHODESIA:	
Hopefountain	10·54
Rhodes Matopo Park	10·84

Departmental Notices.

FRUIT TREES FOR SALE.

GOVERNMENT EXPERIMENTAL ORCHARD, POTCHEFSTROOM.

The following is a complete list of the fruit trees for sale for the coming planting season. As in former years the price is 1s. per tree, with the exception of apples, which, being worked on blight proof stocks, are worth 1s. 3d. Owing to the wider ground of distribution under Union, the number of trees allotted to one applicant is limited to 100.

Many varieties are propagated with special reference to their suitability to Transvaal conditions only.

Orders should be sent in to arrive on 1st May (no order will be accepted before that date). They must be sent to the Government Horticulturist, Agricultural Department, Pretoria, and will be duly acknowledged and information given in due course as to whether they can be executed or not. Where the delivery of trees is promised, an account will be sent in June for the amount due, and the trees must be paid for before 1st July. Delivery will take place during July, carriage forward.

No guarantee is given that all orders can be executed.

The collect on delivery system adopted last year resulted in considerable loss to the Department, and that has led to the adoption of the above system.

Cheques and postal orders should be made payable to the Government Horticulturist, Agricultural Department, Pretoria.

Double Flowering Peaches:	
Clara Meyer	27
Rosa Fl. Plena	29
Double Crimson	20
Versicolor	35
Double Pink	16
Splendens	10
Peaches:	
Belle Bauce	17
Elberta	46
Mountain Rose	40
Abec	37
Crimson Galande	37
Dr. Hogg	42
Mamie Ross	36
Oriole	49
Peento	35
Waldo	41
Pallas	34
Brook	22
Apricots:	
Powell's late	10
Warwick	22
St. Ambrose	4
Blenheim	27
Early Newcastle	27
Early Cape	15
Bush Peach	12
Kaisha	27
McLea's late	15
Montgamet	43
Large Early	6
Royal	24
Japanese Plums:	
Shiro Smomo	47
Ura Beni	55
Chabot	45
Burbank	61
Satsuma	33
Red Nagate	57
Royal	22
Japanese Plums—(*continued*):	
Wickson	24
October Purple	31
Chalcot	27
Combination	5
Methley	4
Bartlett	5
Pears:	
Ile de Vienna	46
Beurre Superfin	50
Douglas	20
Fertility	23
Beurre Diel	28
Beurre Easter	28
Bon Chretien	45
White Doyenne	15
Louise Bonne de Jersey	52
Apples:	
Adam's Pearmain	38
Wemmershoek	42
Roxbury Russet	25
Alexander	2
Stirling Castle	19
Bismarck	3
Watsonville Special	3
England's Glory	16
Rhode Island Greening	19
Lady Henniker	8
Lady Carrington	24
Ohenimuri	14
Nickajack	13
Cleopatra	2
Rome Beauty	18
Versfeld	8
Stone Pippin	16
Taupaki	9
Cox's Pippin	13
Hugo	8
Prunes:	
Pissardii	103

Office of the Administrator,
Capetown, 13th February, 1911.

CARP AND TROUT: SUPPLY OF.

It is hereby notified for general information that Carp, Trout Fry, or "Eyed Ova" will be supplied from the Jonker's Hoek Trout Hatchery, Stellenbosch, on application.

All applications for Carp or Trout Ova to be sent direct to the Curator, Trout Hatchery, Stellenbosch, *not later than the 30th April in each year;* a duplicate thereof, together with the remittance and any correspondence relating thereto, to the Provincial Secretary, Capetown. The actual notice of the dispatch of any consignment will, however, be sent from the Hatchery by the Curator.

Applicants are requested to give their addresses in full, and also to name the Railway Station to which the Carp, Fry, or Ova are to be consigned, and, in the event of the Trout Ova having to travel by post-cart, applicants are requested to state the nearest Post Office to their farms or homes, number of hours occupied in journey from Post Office to destination and days of week that mails are received at the nearest office, and if the fish or ova are required for a river or dam.

Carp will be supplied at 10s. per dozen and *Trout Fry* at a charge at the rate of £2 (two pounds) per thousand, when available, *payment to be made in advance.* Government responsibility for Carp and Fry will cease on delivery at Stellenbosch Railway Station. *The purchase of Fry is not recommended on account of the risks attending transport.*

In the case of both Carp and Fry, an additional charge of 5s. will be made for transport to Stellenbosch, together with 25s. for the car-boy or carrier in which the fish are forwarded: the latter amount will be refunded on return of the car-boy (which may be sent back *free* if marked "Returned Empty") intact to the Railway Station at Stellenbosch.

Trout Ova (eyed ova), packed in moss, will be forwarded by Parcel Post to any address in the Colony at a charge of £1 (one pound) per thousand, in addition to a charge of 5s. to cover cost of packing, postage, etc., per parcel containing from 1000 to 3000 ova. *Payment to be made in advance.*

The spawning season for Carp is from November to December, and that for Trout from May to September.

Remittances may be made by Money Order, Postal Note, or Bank Draft, payable to the Provincial Secretary, Capetown.

Hatching Boxes, designed by the Curator of the Hatchery and capable of hatching up to 3000 Fry, may be obtained from Mr. WILLIAM LOW, 64 Dorp Street, Stellenbosch, at a charge of £1. 15s. (one pound fifteen shillings), delivered on the railway; payment to be made to Mr. Low direct and the remittance to accompany the order.

These boxes will be personally examined by the Curator before dispatch.

Printed pamphlets containing full instructions relative to the transport of Fry, hatching of Ova, or construction of Hatching Boxes, will be forwarded *free of charge* on application to the undersigned.

Government Notice No. 1444 of 1909 is hereby cancelled.

NOEL JANISCH,
Provincial Secretary.

FARM EMPLOYMENT.

Applicant, aged 16, is desirous of obtaining employment on a farm with a view to learning all he can regarding mixed farming. Is a well-built lad, and anxious to start work, and willing to make himself useful in any capacity.—E. TURNBULL, The Residency, Empangeni, Zululand.

Hard-working energetic farm hand, 24 years of age, with knowledge of common nursery work and forestry (wattles and gums), stock, and general farming, wants situation on farm within five mile radius from railway station. Good references. Strictly sober.—H. BERNHARD, c/o Wm. Clark, Esq., Kenterton (Private Bag), via Esperanza, Natal.

Agricultural Show Dates, 1911.

TRANSVAAL PROVINCE.

Johannesburg.—19th to 22nd April.
Schweizer Reneke, Bloemhof, Christiana } Combined.—3rd May.
Potchefstroom.
Zoutpansberg.—17th May.
Rustenburg.—24th and 25th May.
Pretoria.—30th May to 1st June.
Barberton.—23rd June.

NATAL PROVINCE.

Vryheid.—June (date not fixed).
Newcastle.—13th and 14th June.
Dundee.—15th and 16th June.
Ladysmith.—20th and 21st June.
Victoria County.—21st June.
Alfred County.—21st June.
Weenen (Estcourt).—22nd and 23rd June.
Umzinto.—28th June.
Pietermaritzburg.—29th and 30th June and 1st July.
Camperdown.—3rd July.
Durban.—5th, 6th, and 7th July.
New Hanover.—20th July.
Richmond.—20th July.
Mid Illovo.—10th August.

Experimental Farm, Potchefstroom.

SEEDS FOR DISPOSAL.

Wheat.—Price 12s. 6d. per 100 lb. delivered at buyer's nearest station:—
Early and medium early varieties suitable for irrigated land—" Australian ", " Ekstein ", " Potchefstroom White ", and " Fourie ".

Rye.—" Early "—Price 12s. 6d. per 100 lb., delivered at buyer's nearest station. This variety is strongly recommended for " green " forage purposes.

Oats.—Price 10s. per 100 lb., delivered at buyer's nearest station—" Boer ", " Egyptian White ", and " Algerian ".

All the above prices are subject to alteration without notice.

These seeds consist of different varieties which have been experimented upon at this farm, and have proved valuable; the crops thereof have been specially grown for seed purposes.

Applications for these seeds should be made on or before the 1st March. No orders will be " booked " until that date, but applications may then be closed, and the available supply distributed pro rata among the different applicants. In that case only orders which are then definitely placed will be considered; an inquiry which is still the subject of correspondence will not be considered a definite order.

Orders must be accompanied by remittance, or if seeds are to be forwarded on the c.o.d. system this authority must be given by applicant. Cheques and money orders should be drawn in favour of the General Manager, Experimental Farm, Potchefstroom, from whom any further particulars can be obtained.

When remitting by cheque exchange must be added. Postal orders should be endorsed.

ALEX. HOLM,
General Manager.

UNION OF SOUTH AFRICA.

CENSUS, 1911.

NOTICE

TO THE

Inhabitants of the Union of South Africa

EXPLAINING THE REQUIREMENTS OF THE LAW IN CONNECTION WITH THE CENSUS TO BE TAKEN ON

SUNDAY NIGHT, the 7th MAY, 1911.

1. The Census will be taken by persons styled "Enumerators", who will call at every house in Town and Country throughout the Union.

2. Before the Census Day, the *7th May next*, a Census form will be left by an Enumerator at every house in Towns and Villages, and will be sent by post or delivered by some official at houses in some of the country districts.

The occupier or person in charge of any house at which a form is left is required to the best of his ability to fill in the required particulars in the form.

If he cannot do this himself he may get some one to do it for him.

3. He must have it filled in and signed, ready for the Enumerator who will call for it on Monday, the 8th May, or as soon thereafter as possible.

4. Where no form is left at a house, the Enumerator will himself fill up one when he calls on or after the 8th May.

5. The form is a simple list of all persons who slept or abode in the house on the night of the 7th May, 1911, whether a member of the family, a lodger, visitor, or servant, etc.; a list of live stock and vehicles kept, including horses, cattle, mules, donkeys, sheep, goats, ostriches, dogs, pigs, poultry, rabbits, and beehives; and a list of live stock in the occupier's charge or possession that died during the year ended 30th April, 1911.

6. The Householder should be prepared, and should instruct the members of his family and all other persons in his house, in case he should be absent when the Enumerator calls, to give, fully and readily, particulars as to—

(1) The NAMES and SURNAMES of every one of them.
(2) Whether they are married, widowers, widows, or divorced, or have never married.
(3) Their AGES last birthday, in years, as near as can be.
(4) Their PROFESSION, TRADE or OCCUPATION.
(5) Their RACE and BIRTHPLACE.
(6) Whether able to READ and WRITE.
(7) Whether being taught at SCHOOL or at HOME.
(8) Their RELIGION.
(9) Whether laid up from SICKNESS or suffering from any INFIRMITY.
(10) The number of rooms in the house, and whether built of stone, brick, or other material.

Persons objecting to state particulars regarding their religion need not reply to questions under this head, and may simply state that they object.

7. All persons, and especially farmers, should count their LIVE STOCK before the evening of 7th May and make a memorandum of the numbers for the Enumerator.

8. No matter when the Enumerator calls, whether on Monday, the 8th, or on some subsequent day, he must be told how things stood on the night of the 7th; for the people will be enumerated at the houses where they slept on that night.

9. If any member of the household is travelling or camping out, or at work away from home and does not sleep at any house on the Census night, and if he returns home or reaches some other house before the Enumerator calls, his name, and the number of any live stock in his charge, must be added to the form or list for his home, or such other house as the case may be, unless his name and live stock have been included elsewhere in some schedule or form.

10. If any person has no home, or if, having a home, he was travelling or camping out on Census night, and did not reach his home or some other house in time to have his name included in some Census form or list, he should, as soon as possible, attend at the Office of some Resident Magistrate, Field Cornet, or Enumerator, then and there to fill up, or supply particulars for filling up a form.

APPEAL TO FARMERS.

11. Farmers occupying half a morgen or one acre of land or more must find out and be prepared to tell the Enumerator when he calls what extent of land they occupy, how much is fenced, the extent under cultivation for each crop separately, and how irrigated, as also a list of agricultural implements and machinery used on their farms, and the quantity of wool, mohair, grain, brandy, sugar, dairy produce, wine, fruit, tobacco, etc., produced during the year ended the 30th April, 1911.

12. It will be difficult in many cases to tell the exact extent of land cultivated. Farmers must, however, give the number of morgen or acres as near as they can. Half a morgen or an acre is 50 by 100 paces. A morgen or two acres are about 100 paces square, and so on.

13. As the cultivation of the land and the breeding of stock represent together one of the principal sources of wealth of this country, it will easily be conceived that a Census without a full and complete enumeration of the farming industry would be seriously deficient, if not absolutely worthless.

14. The Government is most anxious to have as complete a Census as possible, and to ensure this object the farmers' cordial co-operation is indispensable.

15. Farmers should realize that if they withhold information, or give in defective returns, their Field Cornetcies and their districts in which they are naturally specially interested will suffer materially in comparison with other parts of the country where the inhabitants come forward with eagerness to make sure that all the people, all the stock, all the houses and cultivated land, all the crops and produce, and all the agricultural machinery and implements are included in the returns.

16. The figures showing the results will be read with interest all over the world, and it should be our endeavour to give the truest and fullest possible returns.

17. It is a most difficult thing to enumerate every single person in the country. This can only be done successfully with the assistance and co-operation of the inhabitants of the country, on which the Government confidently relies.

PENALTIES, ETC.

18. The PENALTY for failing to deliver to a Census Officer on demand any Census Form left at any person's dwelling or premises, or refusing or neglecting to supply, or untruly filling up or untruly supplying, the required particulars, or obstructing any person performing duty under the Census Act, 1910, is a fine not exceeding £50 or three months' imprisonment with or without hard labour, or such imprisonment without the option of a fine. Special care will be taken that the information given will not be used for the gratification of curiosity.

19. ANY OFFICIAL DIVULGING THE CONTENTS OF ANY FORM IS LIABLE TO THE SAME PENALTY.

20. No part of the Census-taking work will be performed on the Sunday.

J. C. SMUTS,
Minister of the Interior.

Department of the Interior,
1st March, 1911.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. I. MAY, 1911. No. 4.

Issued MONTHLY in English and Dutch by the Department of Agriculture.
Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria.

Subscriptions to the *Agricultural Journal*.

The annual subscription to the *Agricultural Journal* can be paid at any time on forwarding two shillings in postage stamps, postal notes, or postal order to the Government Printer, Pretoria. This notice seems to be necessary, as many people are under the impression that unless the subscription was paid before the end of March it would not be accepted. The original notification was that *all free issues* would cease by the end of March, and those desirous of receiving the publication after that date could only do so on forwarding the amount of the subscription. Numbers of subscriptions are being received daily in the Editor's Office, and we are compelled to request that these be sent in all cases direct to the Government Printer, Pretoria. On the other hand, letters are frequently addressed to the Government Printer asking for information from the Editor. These should always be addressed "The Editor, *Agricultural Journal*, Department of Agriculture, Pretoria".

Diseases and Ticks.

Dr. Theiler, in the current issue, contributes a revised (second) edition of his very interesting and complete article on "Diseases, Ticks, and Their Eradication", brought up to date. This article was published previously in the late *Transvaal Agricultural Journal*, and was reprinted for general information, but the subject is of such paramount importance that its republication calls for no excuse, considering that further information is given, and that a large number of farmers in the other Provinces of the Union have not had an opportunity of reading it. This revised edition will also be reprinted in both languages for the information of those who may not receive a copy of this issue.

Another article on the ever-recurring tick question appears in the current issue detailing the further course of some valuable investigations carried on at Messrs. Cooper & Nephews' farm in East London district, on the possibility of eradicating ticks from a given area by means of the starvation method. The first report on these investigations was published in the late *Cape Agricultural Journal*, and that in the current issue is of interest as carrying the subject another step on the road to finality. The net result does not seem to offer too much encouragement to others to embark on a scheme of this nature, and brings us back to the practical resort of dipping as the one remedy so far discovered as likely to prove most effectual in our efforts to

control this terrible pest. This negative result is, however, of great value, as it practically exhausts what at one time was considered a possible method of control.

Sugar from Maize.

The probability of turning the great maize producing powers of South Africa into channels which should prove more profitable than the present methods of disposing of those crops is, and must always be, a most fascinating subject for discussion. That we do not reap the full benefits of that magnificent industry under existing conditions is very well known, and that we should, in the near future, devise more profitable means of disposal is the hope of every one interested. One obvious improvement is, of course, the consumption of the crop, or the greater portion of it, by feeding to farm animals in this country, and exporting the resultant products in place of the raw grain. For this there is much to be said, more particularly, as has been so frequently pointed out of late, if the crops in uncertain areas were grown for fodder instead of grain. But to attain this very desirable consummation, the country will first have to provide itself with a type of farm stock which may be expected to give a good return on the crops consumed. For this we shall have to wait some time yet. In the meantime the area under mealies is increasing, and no harm can be done by looking into the possibility of establishing other industries which would give profit and employment in the manufacture of the products of this exceedingly valuable plant. In the current issue two contributors give particulars of such industries which are being established in other countries, and, if successful there, should be of great value here. The production of sugar, starch, and other by-products from maize is by no means new, but whether the very sanguine estimates outlined by our contributors will be realized on an industrial basis has yet, we understand, to be proven. However, the subject is of such importance to this country that further inquiries are being set on foot and in the meantime it would be of interest to receive any particulars which our readers may come across, only provided the source is reliable. It has always to be remembered, however, that to set such an industry firmly on its feet in a country like South Africa, with its peculiar labour conditions, would call for the greatest care and forethought, as well as much capital and organising ability. The sugar cane industry of Natal is the nearest approach to anything of this kind which we have as an example, and the history of that effort is sufficiently full of warnings to give thoughtful men pause before embarking on similar adventures. The sugar industry is now well established, but its path has not been entirely beset with roses.

Field Trials of Agricultural Implements.

The Cradock Agricultural Society has the honour of being able to claim that it has been successful in establishing the virtue of field trials of agricultural implements and appliances, an example which has been followed by others. For the past three years at least something of value and use to the farmers of the surrounding districts has resulted from these competitions, and the latest attempt is not by any means behind its predecessors. The construction of workable sluices and sluice gates for practical application on the ordinary

irrigation farm in this country may seem a simple matter. In reality it presents many difficulties, the first of which is usually cost of construction. At the Cradock trials, as will be seen by the report and illustrations in this issue, these facts were demonstrated to a nicety, but it is doubtful if we shall ever arrive at a more suitable contrivance than that submitted by Mr. Llewellyn J. Roberts, of Fort Beaufort (and tubular gate fame). It is simple, effective, workable, and cheap, and as Mr. Roberts has kindly authorized us to publish the full details for the benefit of all and sundry the irrigation farmers owe him a debt of gratitude. We trust that the Cradock Society will continue this good work, and it is gratifying to note that for next season the prize offered is £25 for the best valve suitable for use in dams. The Middelburg (Cape) Society is also taking this matter up, and will offer, we understand, the huge premium of £100 for the best and most suitable wheeled dam scraper. There are so many differing views as to the proper construction of these implements that this competition should attract the pick of the mechanical genius of the country. As it is open to all-comers, there is an opportunity for the other Provinces to be represented. These prizes may appear large, but it has been found by experience that a sum even out of proportion to the possible value of the implement to be tested, brings the most satisfactory results, as it is so well worth working for.

Swiss Milch Goats in South Africa.

Many correspondents have inquired of late as to the possibility of the Swiss Milch Goat in this country, and those interested will find some particulars in the current issue under the above heading. The details there given cannot exhaust the subject, for, from what we hear, a large number of these goats, mostly grades of kinds on the goat of this country, are being offered for sale in other Provinces as well as the Cape. Any information on this subject which readers may possess would be of interest just now. There is one point in connection with the use of goats' milk which will have to be considered. During the last year or two several cases of Malta fever have been reported from various places, and as the goat is credited as the transmitter of this disease, it would be as well if this point could be cleared up, for it would be a far from welcome addition to the list of diseases already with us.

Farmers in Council.

The month of April has seen the assembling of three very important gatherings of agriculturists. In the Cape the Central Association has sat at Graaff-Reinet and discussed its usual programme of subjects. This is the veteran Farmers' Congress, which for many years past has assembled to ventilate the troubles and grievances of the man on the land in the Cape Province. In the Transvaal and Natal the respective Agricultural Unions have assembled and discussed local affairs prior to the usual annual conference of the South African Agricultural Union, which this year will represent the whole of the Union, with the possibility of Rhodesia sending delegates as well. The Cape Agricultural Union will assemble early in June at Port Elizabeth, when a further instalment of debate and discussion will be indulged in. With all these conferences and congresses it seems more than a pity that some understanding cannot be arrived by which

some form of merging could not be arranged. The recent amalgamation between the Union and the Organisatie Vereeniging in the Transvaal should act as a stimulus to these bodies, and the South African Union seems the institution best fitted to take up the labour of co-ordinating the work of the different constituents. Apart from the waste of time, the loss of energy and lack of force which must follow the methods now adopted seems deplorable. With the Union of the four Provinces there should be room for more complete organisation of their agricultural interests without all these congresses and conferences being continually held.

Cape Grapes in London.

The Fruit Grower of 30th March states: "The Cape grapes which arrived this week varied considerably in condition, some being very poor and some particularly good. . . . A number of complaints were heard as to the weights of these grapes, and one mark in particular was singled out, the tare of the supposed 10-lb. box being 5½ lbs., and with the gross weight of 13½ lb. the shortage in the net weight of fruit is only too evident. It is a pity that such packages should be allowed to come through, as they are likely to seriously injure the reputation of the Cape fruit, which has otherwise a good name." After such a very broad hint, the Cape shippers should take care that this kind of thing is not allowed to occur again. It is in all probability an accident, but such accidents should not be possible in so well organized an industry.

Grootfontein School of Agriculture, Middelburg, Cape.

In view of the frequent applications received by the Principal in regard to the admission of students to the Grootfontein School of Agriculture from dates other than at the beginning of the session, the Principal of the school notifies for general information that students are only admitted to the institution at the commencement of the school session in January of every year. In order to ensure entrance to the school, however, parents or guardians of prospective students are requested to note that applications may be made at any time for admission, when the intending student's name may be enrolled provisionally as from the session commencing in the ensuing January. It is advisable to make this application at an early date in order to obviate the possibility of disappointment, as in all cases the student's name is enrolled according to the date of application.

Applications for provisional enrolment, unaccompanied by the usual application forms, will be received up to and including 31st October in every year, but between this date and the 30th November in the same year the required application forms must be forwarded, duly completed, in support of such applications without fail, otherwise the student's name will be deleted from the provisional list, and thus endanger, or possibly prevent, his admission to the coming session. All applications for the admission of students received after the 31st October must be accompanied by the necessary application forms, duly completed. As stated, each school session commences in January of every year, and the course entered upon is for two years. The application forms referred to above are contained in the prospectus of the school, copies of which are obtainable on application to the Principal, Grootfontein School of Agriculture, Middelburg (Cape).

A Portable Cattle Dip.

Among the many implements and appliances on view at the Johannesburg Show was one that was bound to attract a good deal of attention. This was what is described as K. Hens' Patent Portable Dipping Tank. It is the portable dip notion arranged for cattle as well as small stock. It is simplicity itself, and, as it appears to be fairly handy, should prove of some service in districts where it might be found unprofitable to erect fixed dips owing either to the paucity of cattle or other causes. The principle is a large iron tank set on wheels, the whole being most substantially constructed. The method of dipping is to drive the stock on to a platform suspended over the tank by chains. When the stock are in position they are secured by a slip bar or rails, and the whole contrivance lowered by means of levers worked by hand right into the dipping fluid in the tank. Light, but strong portable gangways lead from the ground to the platform on the tank, the one acting as an entrance and the other as exit. When the stock have been immersed long enough the platform is raised, the superfluous dip drains off, and the cattle are allowed to walk quietly down the exit gangway. The whole process is quite devoid of fuss, provided the cattle are sufficiently tame to allow themselves to be handled. What would happen with some of our semi-wild herds it is difficult to say. The tank will dip several head of cattle at once, and if driven by an engine would get through a large number in a day. The agents for this latest dipping appliance are Messrs. Clark Bros. & Brown, Commissioner Street, Johannesburg. The operator assured us that it could also be used for dipping sheep. One decided advantage is that the stock can be immersed to any depth, as the whole contrivance can be regulated by the levers.

Ostrich Farming in the United States.

They have some essentially practical methods of ostrich farming in America. The South African farmer may pride himself on the fact that he has the high-class birds, and that it will take many years for any competitors to equal him, but the American farmer undoubtedly makes the larger profits, for he not only grows feathers but prepares them on the spot for sale. We gather from a copy of the prospectus of the Cawston's Ostrich Farm, Ltd., California—kindly forwarded by Mr. H. A. Baily, secretary to the Transvaal Landowners' Association—that it is in course of flotation for no less a capital than £240,000, and the prospectus is so favourable that there seems little doubt as to the success of the venture. The main feature is that the profits are so big, the estimate reaching something like £30 per bird in full plumage. This is accounted for by the fact that there is an import duty of 15 per cent. on all feathers imported into the United States, and that the company does away with all the middlemen's profits by preparing the feathers themselves and selling only in retail parcels. In addition to that, a large revenue is derived from visitors to the farms, this source bringing in some £3000 a year. This is rendered possible by the fact that the farms are situated in close proximity to large centres of population, and are thus turned into a pleasure resort for the curious. The original flock consisted of fifty birds imported by Mr. Edward Cawston from this country in 1886. New blood has been introduced from time to time from North Africa, and the stock now appears to be about 800. Of course, these will increase, but our

feather growers need not tremble for their industry as yet, for, according to the returns, ostrich feathers to the value of nearly a million sterling were imported into the United States last year in spite of the 15 per cent. duty, and with the constantly increasing population of that country this demand will increase. But there can be no doubt as to the position of the Cawston concern; to use a sporting phrase they seem to be on velvet. The regret is that our feather growers cannot do something similar, but the scarcity of population forbids any such thing in this country. It is interesting to know of these things.

Wire in Lucerne.

A farmer in the Western Province (Cape) states that he has experienced trouble of a serious nature owing to the presence in bales of lucerne of pieces of baling wire from three to fifteen inches long. This has resulted in the loss of several animals. This can only be due to most reprehensible carelessness in baling, and the pity is that this gentleman is not in a position to trace the fodder to the farmer who supplied it. In such a case the supplier would be liable for the loss entailed, for when a man buys lucerne hay he does not expect to be supplied surreptitiously with baling wire in that particular form. The proper place for the wire is outside the bale, and for any clippings to get into the bales is one of those things which tend to hinder the progress of an industry. The lucerne industry has gone ahead very fast of late years, and dairymen and stockowners generally purchase large quantities for feed. If they are to be subjected to losses of this description owing to the carelessness of the suppliers they will be exceedingly careful with whom they deal, and possibly look to other sources for a safer and more reliable fodder.

The Improvement of S. A. Wine Brandy.

The following extracts from the Report for 1910 of the Government Board of Reference appointed under section 12 of Act No. 42, 1909 (Cape), for the purpose of classifying spirits distilled from the produce of the vine, are published at the suggestion of the Hon. Minister for Commerce and Industries:—The samples submitted to the Board of Reference during 1910 widely differed in quality. They could all be of equally good quality if only that care and attention were given to the production of brandy which is observed in other wine-producing countries. There is much room for improving the quality of colonial wine brandy. Considering that in our climate year after year the grapes come to perfection, containing a high percentage of sugar, and of a most exquisite flavour, the wine brandy obtained from these grapes should surpass in quality the production of those countries in which the vine grows under less favourable climatic conditions. In the most famous brandy district of the world, the Charente, the greater part of the wine brandy is still prepared in simple pot stills, exactly the same kind as our farmers use. But the wine-growers in the Charente observe the utmost care in the making of the wine, as well as in the distilling of the same, and the production of the brandy. Visiting the wine farmers and distilleries near Cognac, one is struck with the cleanliness which prevails in all their operations. There are no mouldy and musty vats and fustage; kettles, coolers, and receivers are kept scrupulously clean, and the quality of the brandy

of different farmers in the same district is the same. The merchants can at once blend all the brandy bought in one district because it is all good.

One often meets the statement that there is a particular soil from which Cognac is made or on which the grape for making Cognac is grown. In his famous work, "Le Pays de Cognac", Professor L. Ravaz, of the Montpellier Viticultural College, mentions twelve different varieties of grapes—white and red—which are used for making Cognac, corresponding with anything between our white French grape and Pontac. But Professor Ravaz lays stress upon the care which must be taken in making and distilling wine. As to the soils of the Charente, Professor Ravaz states that they vary from clay soils to white lime soils.

The Ostrich Feather Market.

Writing on the 31st March, the London correspondents of Messrs. John Daverin & Co., of Port Elizabeth, report as follows on the Ostrich Feather Market:—"At the public auction just concluded, there was a fair attendance of buyers, and the bidding was fairly general, but, nevertheless, rates were not much above last sale, except for the longest best Whites, all kinds of White Boos, Spadonas, and the medium size Floss, which show a rise. Common classes of narrow Whites and Feminas did not maintain the high prices of last sale; long and medium Drabs were decidedly cheaper, especially narrow and inferior—in fact, common shorts were extremely hard to sell, and brought very low rates. As a matter of fact, the finest pluckings realized the best prices, common qualities being more difficult to dispose of. The Continent, especially Paris, with the assistance of Vienna, have again created a record price for Whites, and protected all the long wings, including soft and flimsy flue, throughout the entire auction; narrow wings, however, have failed to maintain the previous extreme quotations. We think it well to draw your attention to the way in which Blood Wings are neglected: this has been the case for some little time past, but we do not remember having actually commented upon it before. The manufacturers prefer to cut down longer feathers for the short lengths they require. London, in spite of the Coronation, has given very little support, and America, although larger buyers than last sale, have not bought to the same extent as formerly."

Tobacco Sale at Capetown.

With a view to fostering the tobacco industry in the Western Province of the Cape, the Capetown Chamber of Commerce is, at the request of the Government, holding another public sale of the remainder of the crop of tobacco grown in the Western Province during the past season. The crop offered for sale consists of approximately 43,050 lb. of Turkish and 2400 lb. Virginian. The sale will take place on Monday, 15th May, at 10.15 a.m., in the Auction Mart of Mr. John Marcus, 30 Burg Street, Capetown.

Fertilizing Value of Lucerne.

When in his system of rotation the farmer is ready to plough up his Alfalfa (lucerne), he has another inestimable contribution to the

land's fertility in the stubble and roots. It is not recommended to plough under any considerable growth as a green manure, as the hay crop is too valuable. Its market value would buy more fertilizers than the same growth is worth for humus. After a field has stood for five or six years, the roots have added largely to the humus content. Professor W. P. Headden, of Colorado, estimated that the fertilizing value of the stubble and six and a half inches of roots ploughed under is about 20 dollars per acre, while the value of the stubble and entire root system is not less than 35 dollars per acre.—F. D. COBURN ("The Book of Alfalfa").

Wool Sales at Antwerp (Belgium).

The following is published at the request of the Chamber of Commerce, Antwerp, Belgium:—At the Antwerp wool sales, where principally Monte Video and Buenos Ayres wool is sold, another lot of eighty-nine bales of South West African wool (from the German Colony) was bought on the 8th and 9th of March, prices being easy and good, namely, from 1s. 3d. to 1s. 6d. per kilo for merino, and from 10d. to 1s. 3d for wool of inferior quality. Also eight bales of sheep skins were sold at 10½d. per kilo.

Ramie Fibre.

Messrs Atuyer, Bianchini & Ferier, Rue Vaucanson, Lyons, France, write that they are desirous of getting into communication with ramie growers in South Africa, with a view to obtaining samples of ramie, and, eventually, of buying the article in quantity. Growers interested might communicate direct with this firm.

Barberton Anti-Malarial Association.

The Barberton Anti-Malarial Association has just issued its first annual report. According to the outline of activities given in the report, the Association is accomplishing very useful work in the direction of educating public opinion up to a sense of the need for a vigorous campaign against the malaria-bearing mosquito. Various pamphlets were issued during the year reviewed (1910), and steps are now being taken in the direction of publishing a school primer explaining the simple facts relating to malaria and mosquito destruction. The mosquito-proofing of hotels, the destruction of breeding places for mosquitoes along public roads, and the organizing of lectures are further directions which the activities of the Association have taken. For the information of those interested it may be stated that the annual subscription is 5s. for gentlemen and 2s. 6d. for ladies. The Countess of Selborne is the Hon. President of the Association.

Cannon-Firing for Rain-Making.

A mischievous belief in the efficacy of cannon-firing as a means of breaking a drought or causing clouds to disgorge their rain is very widely spread. If the firing of heavy ordnance did have any such effect, we should expect Shoeburyness to be one of the rainiest places in England, because of the trial-firing of great guns there: but in point of fact, the neighbourhood is the least rainy in England. On the other hand, we find Benvenuto Cellini, who flourished in the 16th

century, claiming that the use of guns actually prevented rainfall. Cellini writes thus:—"When the duchess made her entry into Rome, I prevented a damage of above a thousand crowns that they were likely to suffer by a heavy rain, upon which occasion, when the Constable was almost in despair, I had revived his drooping courage by pointing several pieces of artillery towards that tract of the heavens where the thickest clouds had gathered, so that when the shower began to fall I fired my pieces, whereupon the clouds dispersed and the sun again shone out in all its brightness. Therefore it was entirely owing to me that the above day of rejoicing had been happily concluded."

We (*Nature*) learn from the Wellington (New Zealand) *Evening Post* of 7th December, 1910, that the New Zealand Government has voted £50 or £100 towards the cost of explosives for rain-making experiments to be made at Oamaru and adjacent drought-stricken parts. It has been shown that such experiments are a useless expenditure of money, and (as stated in the article) have been condemned by the best meteorologists of Europe and America. *Symon's Meteorological Magazine* (July-September, 1908) contains a careful report by Mr. D. C. Bates, who was ordered to watch and report upon rain-making experiments previously carried out in the same district. He states that "the explosions had apparently no more effect on the vast expanse of the air than would the striking of a match in a room". In a lecture printed in *Popular Science Monthly* for January last, Professor C. Abbe, one of our leading authorities on meteorology, states, in connection with laboratory experiments on the formation of cloud and rain:—"I think you will see that the firing of cannon or dynamite in order to make a great noise is not likely to form rain, and, in fact, cannot possibly bring it down." And, further, with reference to the cannon used in Italy to send vortex rings of air into the clouds, he says:—"We have no evidence that they ever reach them, or that they could have any effect if they did so . . . I regret to think of so many thousands of farmers wasting time and money on this delusion"; and with these opinions we entirely concur. The situation was saved in the present instance by rain having fallen before the explosions took place.

Thorley's Farmers' Almanac.

With reference to the note which appeared in the February issue regarding Thorley's Farmers' Almanac, Messrs. R. Wilson, Son & Co., Capetown, the South African agents, have written stating that they have been inundated with inquiries for the almanac, and that their stock, as well as that of the publishers, is now exhausted. They are unable, therefore, to supply further copies of the almanac.

Messrs. Starke & Co.'s Catalogue of Seeds.

Messrs. C. Starke & Co., Ltd., of Mowbray, Cape Province, have issued their 1911 Catalogue of Seeds for the Farm and Garden. The catalogue, which consists of over eighty pages, is well got up, covering all kinds of agricultural and garden seeds suitable for South Africa, as well as farm and garden implements. A good index renders the various kinds of seeds, etc., easy of reference.

Cattle Dipping Experiences.

Referring to a test which was held recently at East London, the *Daily Dispatch* remarks that it was particularly noticeable that the majority of the cattle brought down were very free from ticks; only in some instances were any visible at all, and then as a general rule on the ears or under the tail, these locations indicating them to be red ticks. On remarking on this to Mr. Matt. Green, who is in charge of the tank this veteran dairyman and cattle farmer asserted his conviction, based on experience, that since cattle dipping had become more or less universal and regular, the number of ticks had shown satisfactory diminution. He spoke of the time, only a few years back, when it was almost impossible to rear a calf, owing to the tick pest, and the ravages they played with the speens of the cows.. Now, however, no breeder has any difficulty in rearing calves. The cows' udders are unaffected, the cattle in general are fat and sleek, and the general improvement recalls the old days of forty years ago—for so far do Mr. Green's recollections carry him—when ticks were almost unknown, when the coast belt supported numerous cattle, and was used as winter veld for sheep by inland farmers, besides carrying no inconsiderable number of sheep owned by residents. "I am convinced", said Mr. Green, "that the blue and bont ticks have been diminished by almost one-half in the last couple of years, and although the red ticks have not lessened to the same extent, it is because the dip does not get at them so well in the ears and under the tails of the cattle. Since Cooper's tick grease has come into use, these are also beginning to be fewer in number, and I see no reason why the good old times should not soon return."

Diseases, Ticks, and their Eradication.

By Dr. ARNOLD THEILER, C.M.G., Acting Director of Veterinary Research.

Revised to date.

THE more we begin to understand the diseases of stock contracted in the veld of South Africa, the more we realize that ticks play an important rôle in their maintenance and propagation. It is, therefore, advisable to review our present knowledge concerning these diseases, as well as the life history of the ticks.

This knowledge will illustrate the utility and even the necessity of eradicating ticks, and will guide us in our recommendations for the methods to be adopted for their eradication. At the same time we shall show, providing the life history of the ticks is taken into consideration, how it is possible to prevent disease by the removal of stock from infected into clean areas.

All tick-transmitted diseases are caused by micro-organisms present in the blood-stream belonging to various tribes of blood parasites, of which the majority are visible by microscope; only one, that of heartwater, has not yet been demonstrated.

BILIARY FEVER IN HORSES.

There is one piroplasm known in equines of South Africa, the cause of biliary fever. It affects horses, mules, and donkeys, but it varies in symptoms in the different animals.

When we say it affects equines, we must make a reservation in stating that the South African animal—the animal born and bred on the veld—when it is grown up is not so liable to suffer from the disease and escapes notice; it only does so under special conditions. This fact finds its explanation in the observation that young equines (foals) do not readily die of the disease, although they contract it as soon as they are exposed to infection on the veld. The chief sufferer, however, is the animal which is bred in the stable of a town or which is imported from oversea; for instance, from England or America, where this disease is unknown. We must remember, therefore, in speaking of piroplasmosis of the equine, that the animal born on the veld of South Africa is immune against this disease. The parasite which causes the piroplasmosis or biliary fever, *Piroplasma equi*, lives within the red corpuscles of the blood, where it multiplies, and then invades a smaller or greater number of other corpuscles. Its action is the destruction of the red corpuscles, and the more of these parasites that are present, or the quicker they multiply, the more dangerous becomes the disease. The destruction of the corpuscles becomes apparent by the anaemia which follows. In the horse, however, this anaemia is hidden, so to say, by a bilious condition. The destruction of the red corpuscles leads to the separation of the colouring matter from the corpuscles, which is deposited in the liver, and there undergoes a change into bile

stain. An over-production of bile takes place, which is carried into the blood-stream, and absorption into the tissue follows. Hence we recognize biliary fever in the horse principally by the yellow discoloration of the mucous membranes. It is very rarely that the destruction of the red corpuscles leads to colouring of the blood plasma and subsequent red urine. In the mule and in the donkey the jaundice is not pronounced, and the white membranes indicating anaemia are typical of the disease.

The curious and remarkable fact has been established that an animal, say a horse, which has recovered from this disease retains the infection in its blood.

We cannot see the organism microscopically in the blood corpuscles of such an animal. The corpuscles have an absolutely normal aspect and the animal to all appearances is healthy, but when we inject the blood into a susceptible imported horse, mule, or donkey, we promptly produce the disease, which can end fatally and be of such a virulent character that it differs in no way from that contracted naturally. This fact has been made use of to prove that the various piroplasms of the horse and the donkey, and of the bastard, are identical.

In our experiments we have proved that the blood of an animal which has recovered, and which for eighteen months has been kept in a stable, still proved to be infective; and it can be concluded that once an animal has recovered, its blood remains infective for the remainder of its life, at least if such an animal remains exposed in the veld.

This disease is carried by ticks—the ticks are the real hosts of the piroplasm.

Our experiments show that the common blue tick * is not implicated in the propagation of the disease, but that the red tick † acts as a host.

We have transmitted the disease with ticks which had been feeding on sick animals and on animals which had recovered. The incubation time of the disease, when contracted from ticks, averages about three weeks.

REDWATER IN CATTLE.

South African redwater is due to the presence of *Piroplasma bigeminum*, a parasite similar to that of the horse, which invades the red corpuscles, multiplies and increases, and causes the destruction of the red corpuscles. Whereas in biliary fever of the horse, discoloured urine, due to the breaking down of the red corpuscles, but rarely occurs, it is almost an invariable symptom in redwater of cattle. This fact is probably explained by a greater delinquency of the blood corpuscles of cattle.

As regards susceptibility, the conditions are similar to those referred to above under biliary fever in horses.

The animals bred in stables and imported from areas free of redwater contract the disease easily and die in great numbers. The calf

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* *Rhipicephalus decoloratus.* † *Rhipicephalus evertsi.*

is susceptible, but it contracts the disease in such a mild form that it recovers easily, and then it is immune for all time, or only under special conditions are breakdowns of immunity noticed.

American investigators were the first to prove in a convincing way that redwater is a tick-transmitted disease, and we in South Africa have repeated the experiment time after time on imported stock and with ticks sent to Paris and London. It is the blue tick * which carries the disease, although lately our experiments have shown that not only this tick can act as host of *Piroplasma bigeminum*, but also the brown † and the red ticks. These two form the exception rather than the rule, whereas with the blue ticks practically every one can transmit the infection.

We have also some experiments which would show that blue ticks collected from horses can occasionally transmit redwater, a fact previously noticed in the transmission of human tick fever, where the progeny of an infected tick remained infective for several generations.

We have stated that the animal born and bred in South Africa is immune, and what we have said about immunity in biliary fever of the horse applies to redwater in cattle. The immune animal retains the infection in its blood. We can prove this at any time by tapping an animal born on the veld and injecting a susceptible imported one; we have done so in many experiments, and lately an experiment of ours has shown that an animal which recovered in 1902 from redwater still had virulent blood in 1909. American investigators have even proved that the blood of a cow which had recovered from Texas fever, and had remained for twelve years out of the infected area, still produced the disease. The incubation period of this disease, when naturally contracted by ticks, is about seventeen or eighteen days.

The progeny of blue ticks of cattle recovered from redwater, and ticks collected at random from any full-grown cattle born in South Africa, transmit the redwater when placed on susceptible cattle.

GALL-SICKNESS IN CATTLE.

Gall-sickness is a term for a disease in cattle, the chief symptom of which on post-mortem is an abnormal bile and jaundiced condition of the body. During life the symptoms indicating a disturbance of the digestive organs, in the absence of other definite lesions, are interpreted as those of gall-sickness. Accordingly any disease has been and is still frequently regarded as gall-sickness. The one most frequently taken for gall-sickness is redwater, or rather that form of redwater in which the red urine has not been noticed or was never present.

In this sequel the lesions of jaundice during life and on post-mortem may be very pronounced, and if the disease is of some standing, the actual agency, the piroplasm, may no longer be traced. As a rule the first outbreaks of East Coast fever are commonly identified with gall-sickness. Although there are discrepancies in the symptoms, yet gall-sickness has always been looked upon to be closely allied to redwater and to occur under similar conditions, in fact to

* *Rhipicephalus decoloratus.* † *Rhipicephalus appendiculatus.*

resemble it so much that the two diseases are called the sister diseases. It is only recently that we were able to support this view, in proving that a certain parasite found in the red corpuscles of cattle and for the last twenty years thought to belong to the life cycle of *Piroplasma bigeminum*, has nothing to do with redwater at all, but represents a genus of its own, and is the cause of the genuine gall-sickness of South Africa. I have called the parasite *Anaplasma marginale*, and the scientific term of the disease, in analogy with piroplasmosis, to be anaplasmosis. In this disease the symptoms of redwater are constantly absent, but otherwise it resembles redwater in many details. It is also transmitted by the blue ticks, and we have noted that the same crop of larvae can transmit both diseases to a susceptible beast. Redwater, having an incubation of seventeen days, appears first; gall-sickness, with an incubation time of from sixty to eighty days, comes later. Recovery from one disease does not protect against the other, which proves their non-identity. As is the case in the true piroplasmosis, the ox which has recovered from the disease retains the infection in the blood, and such blood, when inoculated, produces the disease in imported animals, and ticks from such animals propagate it.

FEVERS CAUSED BY PIROPLASMA MUTANS.

Cattle born on the veld of South Africa show sometimes in their blood a small parasite belonging to the group of piroplasms. I have called it *Piroplasma mutans*. Morphologically, it so much resembles that of East Coast fever, that its identification becomes occasionally difficult. It is inoculable and appears after a long incubation time, lasting from twenty to fifty days, and causes a low fever of some duration, during which time the blood shows the lesions of anaemia.

It does not cause death. We have been able to transmit it by means of red and brown ticks. Similarly to what is known as redwater and gall-sickness, this parasite is also present in the blood of a recovered animal. It is found occasionally very frequently in connection with other diseases under the influence of which it reappears.

FEVERS CAUSED BY SPIROCHAETES.

Spirochaetes are blood parasites in the shape of small curves looking like a corkscrew swimming in between the red corpuscles of the blood. They have been found in horses, cattle, and sheep of South Africa. Their injection into a susceptible animal gives rise to a high fever, which, however, in my experience, has never ended fatally, yet symptoms which point to the destruction of the red corpuscles are present, and are easily recognized microscopically. We have transmitted the parasite artificially by inoculation. The fact interests us that not only the animal which is suffering from such a fever, but also the recovered animal, retains the infection in its blood, and such blood proves infective at any time.

The disease is transmitted by the blue tick. We have proved this undoubtedly in several instances, and it has been verified by Laveran in Paris, to whom we sent the ticks, which promptly produced the disease in Paris. This disease does not play an important rôle as

the cause of death, but may be occasionally responsible for fever and loss of condition in any of the mentioned animals. We have met with it occasionally in smears sent to us from cattle supposed to be suffering from gall-sickness.

EAST COAST FEVER.

This formidable disease has, during the last eight years, played considerable havoc, and is still prevalent in South Africa. It is due to a parasite resembling the group of piroplasms which invades the red corpuscles; it multiplies within the lymphatic system of the body to such enormous numbers that finally almost every corpuscle contains one or more of them. Unlike the other piroplasms which we have described, it does not cause the destruction of the red corpuscles, or, if so, only to a slight degree, and the cause of death of an animal is not due to an acute anaemia as in other diseases, but due to intoxication by the metabolic products of the parasite. It differs from the before-mentioned piroplasms in other ways and the principal one is that it is not inoculable by blood from a sick animal into the blood-stream of a susceptible one.

It further differs from the other piroplasms by the fact that the immune animal does not retain the infection in its blood. We have observed this in practice, and experiments which we have made with ticks have failed in every instance. Further, it is different by the presence of peculiar bodies in the internal organs of sick animals, which represent a developing stage in the life cycle of the parasite and typical of other protozoa, and which give us a diagnostic medium of recognizing it from *Piroplasma mutans* infection, of which I have said that it sometimes causes difficulty in diagnosing. So it becomes evident that the parasite of East Coast fever is not a proper piroplasm at all, as it has been described previously, and it is for this reason that a new genus has been made by Bettencourt, to which he has given the name of *Theileria*.

This disease is transmitted by ticks, namely, the red tick, the brown tick, the shiny brown tick,* the Cape tick,† and the black-pitted tick,‡ as Mr. Lounsbury and I have proved in many experiments.

The important fact to be borne in mind in connection with this disease is that recovered animals have as yet not been proved to act as reservoirs of the virus.

The incubation period in this disease, when transmitted by ticks, varies from ten to twenty days, and averages about thirteen days.

HEARTWATER IN CATTLE, SHEEP, AND GOATS.

This is a disease in which we have not yet any visible organisms. We prove their existence by the inoculability of the blood of a sick animal into a susceptible animal which promptly produces the disease. The action of the parasite is an intoxication of the body, as a result of which the animal may die.

* *Rhipicephalus nitens*. † *Rhipicephalus capensis*. ‡ *Rhipicephalus simus*

The disease is tick-transmitted, as Lounsbury first proved; the experiments undertaken for this purpose have shown that the bont ticks* play an active rôle in the propagation of it, but only when they have been sucking blood from an animal suffering from the disease, and not from an immune animal. The incubation period varies from five to fifteen days in goats, and about twenty to twenty-five days in cattle. It is of special interest to us that immune animals do not retain the virus in their blood.

RESERVOIR OF VIRUS.

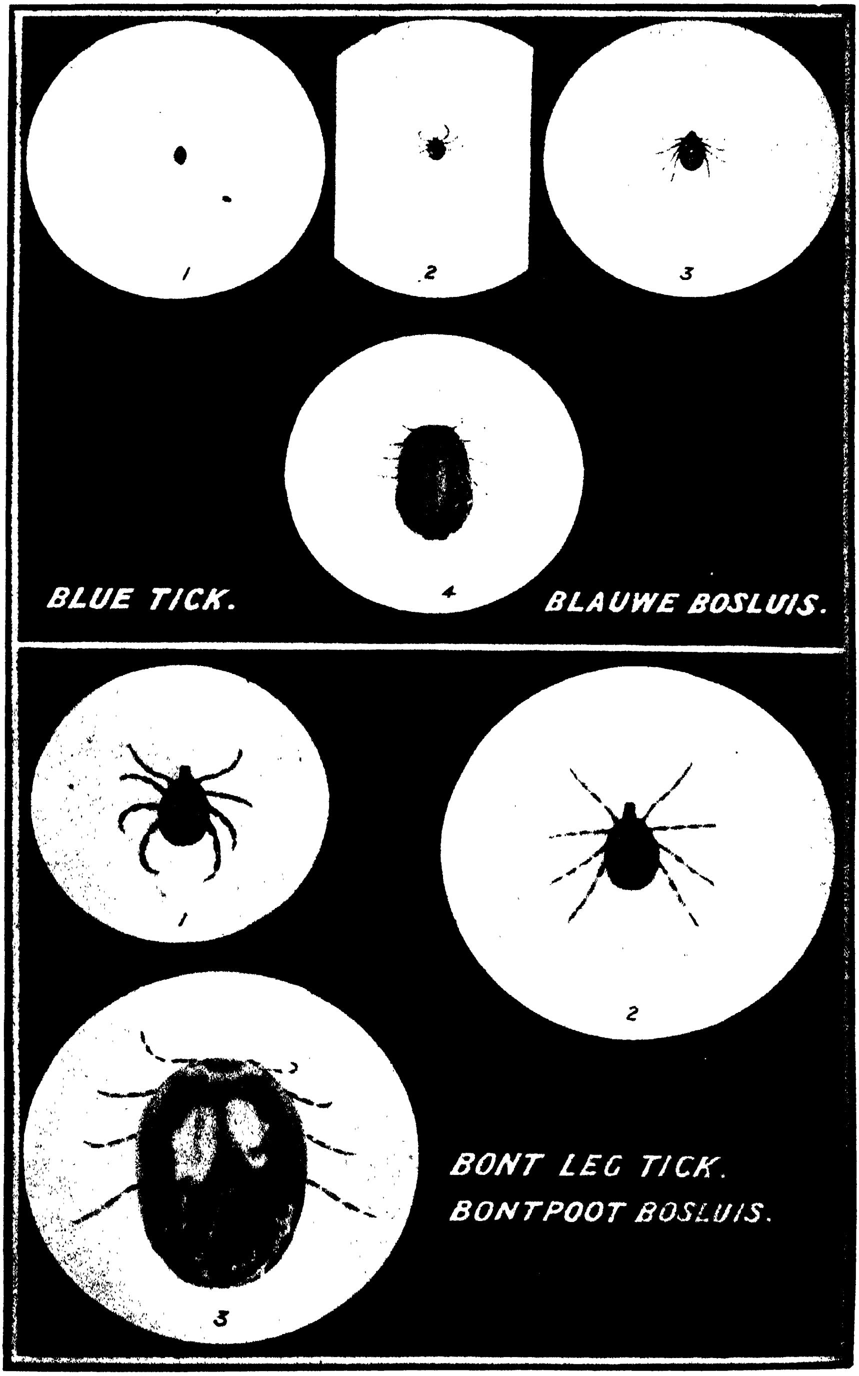
The diseases which are tick-transmitted in South Africa may be classified into two groups. One, in which the immune animal retains the infection in the blood, in other words, in which the recovered animal acts as a constant reservoir for the virus; and the second group where the blood of a recovered animal becomes sterile and therefore harmless. The former fact explains the reason of the constant infection of African veld by redwater, biliary fever, and gall-sickness. The animal which recovers from the disease acts as a host for the ticks. The ticks become infected with the parasites and in turn carry them back to the animal. In this way a circle is formed between the animal, the cause of the disease, and the tick. The tick and micro-organism of the disease are dependent on the animal; without the animal their life cycle would finish. They require the animals for the multiplication of the species, and accidentally, through the invasion of a great number of parasites, such an animal becomes sick and may die.

An adaptation between the animal and the micro-organisms results, by which both benefit, the animal with its immunity and the parasite with a permanent home. It can be deducted from these facts that the disease would have to disappear if we were able to break the circle by removing either micro-organism or tick, as the life cycle would naturally come to a standstill. It must be reasonably expected that the easiest thing to attack is the tick, but to attack it successfully its life history must be properly explained.

THE LIFE HISTORY OF THE TICK.

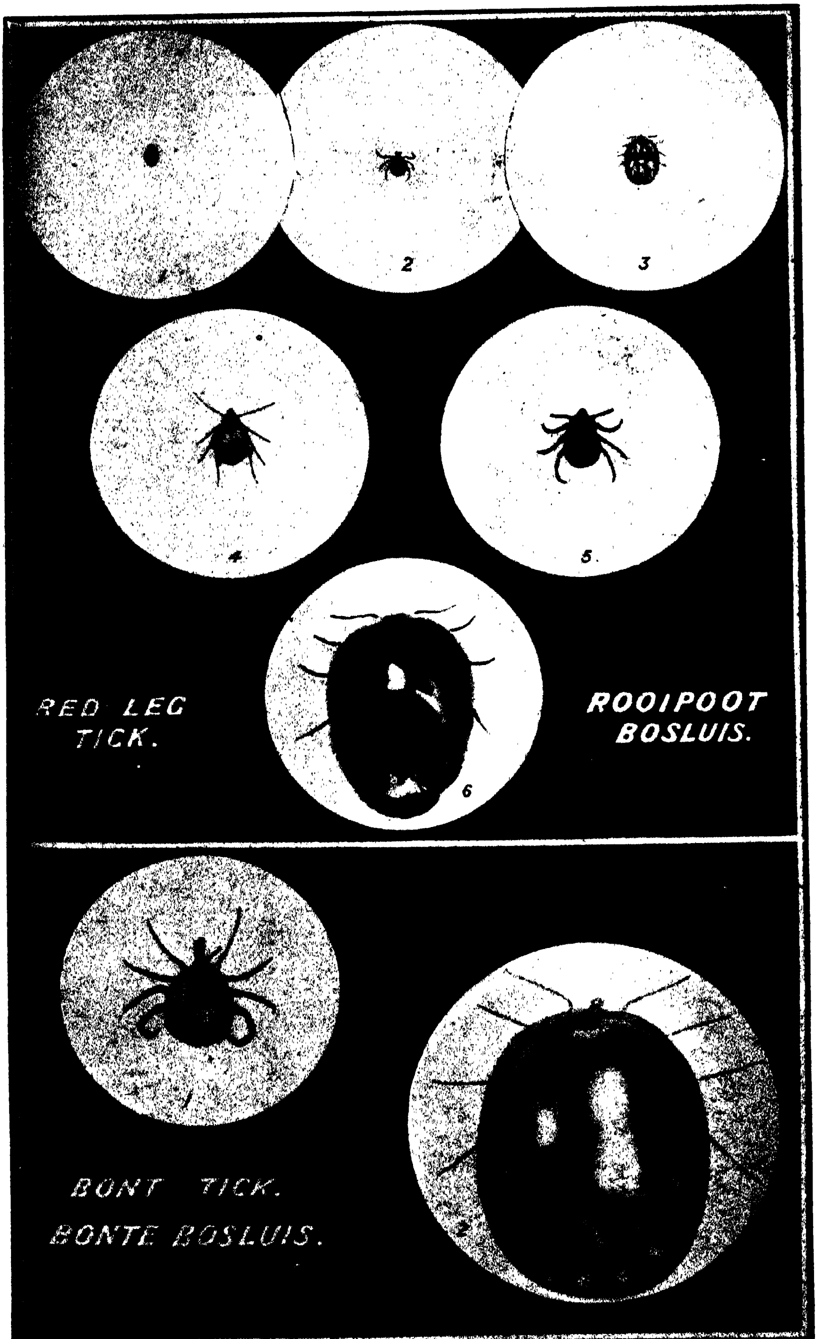
The ticks belonging to the order of *Acarinae* are easily recognized by the naked eye as flat bodies when not engorged, or more or less swollen when engorged with blood. We distinguish male and female in the adults, the male always remains flat, whereas the female engorges and grows in size; in this country the latter is usually known as the tick proper. Male and female meet on an animal, and after feeding they seek each other for copulation, and as soon as the fertilization has taken place the female engorges. Underneath this engorged female, the male can usually be found. Before repletion the female is about the same size as the male. The presence of the small tick underneath the female, especially in the case of the blue tick, has led to the popular opinion that this is a young one. After the female has repleted herself she drops and hides in the grass or in the sand. Soon after hiding away in this manner she begins to lay her eggs. This process of oviposition varies in length of time according to the

* *Amblyomma hebraeum.*



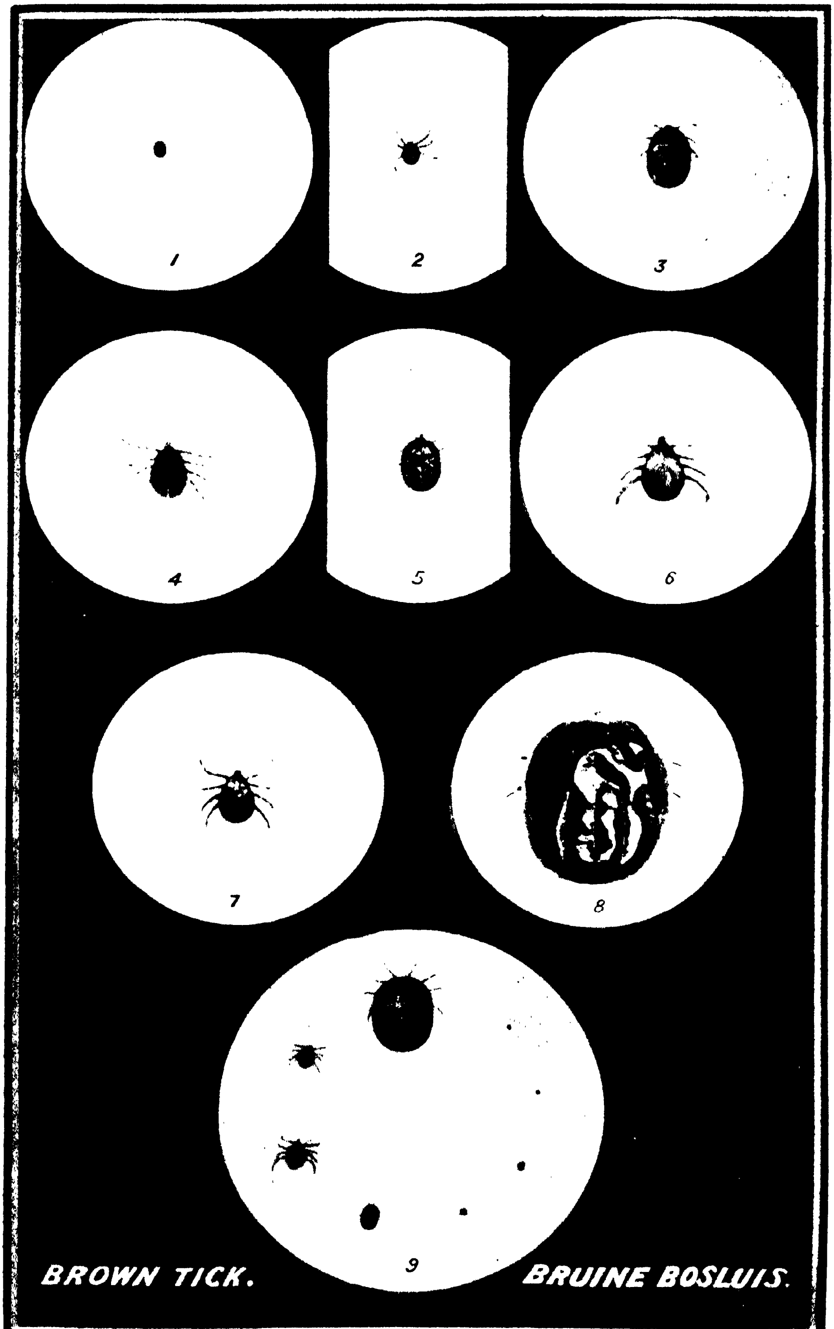
Blue Tick.	*Number of times magnified.*
1. Ova	5
2. Larva	5
3. Adult male	2
4. Adult engorged female ...	2

Bont Leg Tick.	*Number of times magnified.*
1. Adult male	2
2. Adult female	2
3. Adult engorged female ...	2



RED LEG TICK.	Number of times magnified.
1. Ova	5
2. Larva	5
3. Engorged nympha	2
4. Adult male	2
5. Adult female	2
6. Adult engorged female ...	2

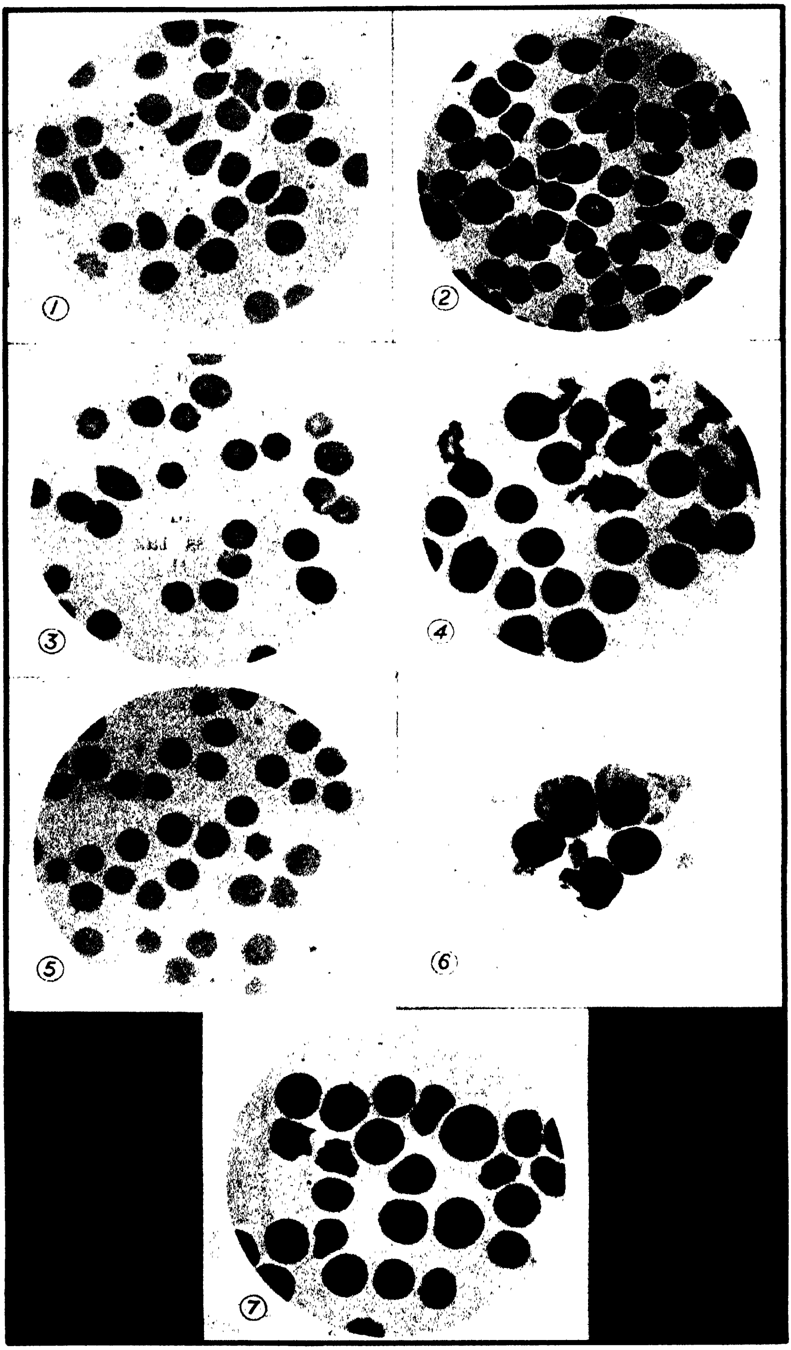
BONT TICK.	Number of times magnified.
1. Adult male	2
2. Adult engorged female ...	2



BROWN TICK.

	Number of times magnified.		Number of times magnified.
1. Ova	5	5. Engorged nympha	2
2. Larva	5	6. Adult male	2
3. Engorged larva	5	7. Adult female	2
4. Nympha	5	8. Adult engorged female ...	2

9. Life cycle of the tick.



1. *Babesia equi* (the cause of biliary fever in equines). 2. *Babesia canis* (the cause of biliary fever in dogs). 3. *Babesia bigemina* (the cause of redwater in cattle). 4. *Babesia mutans* (the cause of a form of gall-sickness in cattle). 5. *Theileria parva* (the cause of East Coast fever in cattle). 6. Koch's bodies (plasma or blue bodies); one of the stages in the life cycle of the East Coast fever parasite. 7. *Anaplasma marginale* (the cause of anaplasmosis—a form of gall-sickness—in cattle).

season in which the ticks drop. After a lapse of a certain period the eggs begin to hatch, and the young larvae appear; they are commonly known as seed ticks, and they seek their way to the top of the grass or bushes, from which they attach themselves to a suitable host which may be passing. So far the ticks with which we have to deal behave similarly, but the various species differ in their habits, and according to these habits we can divide them into three groups.

Firstly, the ticks which, for the completion of their life cycle, require only one host. To this group belongs the blue tick. It reaches the host as a larva; it moults (changes its skin) on the animal from the larval into the nymphal stage, and again from the nymphal stage to the adult stage. In the adult stage the sexes meet again, and the life cycle begins afresh.

Secondly, ticks which require two hosts for the completion of their life cycle. To this group belongs the red-legged tick. It comes as a larva, it moults into the nymphal stage, and leaves the animal as an engorged nympha. The moulting process takes place in the ground from the nymphal to the adult stage, and the sexes meet again on the host.

Thirdly, ticks which require three hosts for the completion of their life cycle. To this group belongs the family of the brown ticks, the black-pitted ticks, and the bont ticks. The larva reaches the animal and engorges, and, as soon as it has done so, drops to the ground, where it moults (after a lapse of a certain time) into the nymphal stage. The nymphae seek a second host, also engorge, and, after repletion, drop to moult into the adult on the ground. The sexes seek a third host, where they meet, and the whole life cycle begins again.

Of interest to us from our point of view are the dates required

(1) for laying the eggs and hatching into larvae;
(2) for the completion of the life cycle on the host in the case of the one-host tick (the blue tick);
(3) the time the larvae and nymphae require to replete on a host;
(4) the length of time the engorged larvae and nymphae on ground require to moult;
(5) the length of time the adult females remain on the host before they drop;
(6) the length of time these various ticks and stages of ticks may live.

Concerning these the following facts are known:—

Blue Tick.—The whole length of time this tick requires from larval to adult stage averages three weeks. From the third week the engorged blue females begin to drop, and about the end of the fourth week they have all left the host. In other words, when we remove an ox or a horse out of the veld and place it in a stable we must constantly expect during the four following weeks the appearance of blue ticks which have been picked up up to the day when the animal left the pasture. The female begins to lay her eggs about five days

after she has left the host. This applies to the summer season only; in the winter it is postponed. The eggs hatch in the warmer season in about three to six weeks, and on an average after about thirty-six days; in the winter it will last longer. The young larvae kept in glass bottles have been known to live six months; if they do not reach the host they die; on reaching the host they continue the life cycle. During this time they sit on the grass; no food is obtained from the plant (as the popular belief is), therefore it follows that the blue tick must finally die if after the above-stated lapse of time no host is found.

The Red-legged Tick.—The hatching period of the eggs of this tick is in summer, about thirty days as an average. We have known the young larvae to live for a period of seven months. In the veld the young larvae which find a host generally hide themselves in the interior of the ear and in the flanks, and soon begin to replete. They undergo the change from larvae to nymphae on the host. The nymphae attach themselves near the place where the larvae were, and replete themselves quickly, so that as early as ten days they may be replete and drop, but generally after an average period of fifteen days. The second moulting process takes place in the ground, and requires an average period of twenty-four days. In our experiments adult red-legged ticks have lived up to a year, and have after that time attached themselves to a beast; such longevity seems, however, to be the exception, and the usual period is less.

The Brown Ticks.—Under this name I include the Cape brown tick * and the shiny brown tick,† whose life cycle is similar to that of the brown tick proper. In addition to these there are some more brown ticks which may act as carriers, but this has not yet been experimentally proved. The brown tick female, after it has been placed on a host, may be observed to drop already fully engorged on the fourth day, and by the end of a week it has usually left the host. The laying of eggs usually begins after six days. The hatching period averages in the warm season twenty-eight days; in the winter-time the hatching takes several months. The young larvae readily attach themselves to cattle and engorge rapidly, and may drop off the host in as brief a time as three days; after the lapse of eight days all engorged larvae have dropped. The moulting process takes place in the ground, and averages twenty-one days. The shortest recorded period was sixteen days. The larvae have in our experiments lived up to a period of seven months and the nymphae to six and a half months. For some days after moulting, these creatures are not able to feed. They are colourless and weak, and refuse to bite if placed on animals. About a week later they eagerly seek attachment when placed on the skin of a host. The nymphae also require a period of about three days to engorge, and within a week have dropped off the animal. The adult ticks appear out of these nymphae in summer-time after an average period of eighteen days. They, like larvae and nymphae, are almost colourless and very weak. A few days later

* *Rhipicephalus capensis.* † *Rhipicephalus nitens.*

they take the characteristic colour, become more vigorous, but require some time before they will readily attach themselves to a host. In our experiments the adults have been known to live up to a period of fourteen months; this is, however, an exception.

The Black-pitted Tick *.—The hatching period in this tick averages thirty days. The larvae do not attach themselves readily to cattle or horses, but to other animals, and the intermediate stages are found on smaller animals. The first moulting usually takes place after twenty days, and the second one, from nymphae to adult, after twenty-five days.

The Bont Ticks †.—The female begins the laying of eggs in summer-time about two weeks after dropping from the host, but over three months may sometimes pass. The shortest hatching period is about ten weeks, but it may last as many months—it averages from four to six months. In our experiments larvae have been known to live seven months. The young larvae replete themselves on a host in from four to twenty days, and the majority always drop between the fifth and seventh day. The first moulting takes place after twenty-five days, but sometimes four months may pass. The nymphae replete themselves on a new host in from four to twenty days. Nymphae have been known in our experiments to live six months. The last moulting process takes place after about twenty-five days, the shortest, and 160 days, the longest. The adult female drops from about the tenth to twentieth day after attaching. Adults have been known in our experiments to live up to a period of seven months.

The Bont-legged Tick ‡ has not been discussed here as it has not yet been proved to act as a carrier of the disease.

TRANSMISSION OF THE DISEASE.

From the life history, as outlined above, the following possibilities may be observed in the transmission of a disease:—

Firstly, the transmission is effected by means of young larvae whose mothers have been sucking blood from infected animals. This has been known to be the case in redwater and spirochaetosis and anaplasmosis; propagation of redwater and gall-sickness by the blue tick is the principal modus; the larvae of the brown tick may transmit redwater, and the larvae of the red tick have proved to be hosts of spirochaetosis.

Secondly, the transmission is effected by one of the succeeding stages, either by the nympha which infected itself as a larva, or by an adult which infected itself as a nympha. The red tick has been proved to transmit biliary fever of horses, spirochaetosis, *Piroplasma mutans* and *Piroplasma parvum* in the adult stage after it had been sucking blood of an immune or sick animal in the previous two stages. The group of brown ticks and the black-pitted tick transmit East Coast fever. It has been proved that the group of brown ticks and black-pitted ticks transmit the disease in their nymphal stage after they have been sucking blood from a sick animal in the larval stage.

* *Rhipicephalus simus.* † *Amblyomma hebraeum.* ‡ *Hyalomma aegyptium*

Further, the group of the brown ticks and the red-legged tick have been proved to transmit the disease in the adult stage after they have been feeding in the nymphal stage on a sick animal. The adult brown tick has also been proved to transmit *Piroplasma bigeminum* of redwater and *Piroplasma mutans.* The bont tick has been shown by Lounsbury to transmit heartwater in the nymphal stage, and in the adult stage after the larval and nymphal stages were fed on sick animals. It has further been proved that, contrary to the experience in East Coast fever, the bont tick can pass its nymphal stage on an animal not susceptible to heartwater without losing the infection it acquired in the larval stage, and transmit it in the adult stage to a susceptible animal. This is not the case in East Coast fever, where experience has shown that a tick after it has once bitten an animal can no longer transmit the disease. It must be emphasized here that the popular opinion that ticks pass from one animal to another and communicate the disease in this way is wrong. The destiny of females is to lay eggs, and of engorged larvae and nymphae to moult, and this makes it possible for them to reach new hosts before they have reached the next stage; therefore, only *males* can pass from animal to animal and can transmit the disease in this way. Indeed, males of any species of ticks which we have mentioned can live for many months on a host, but their peculiarity is to remain on that host, which they only leave accidentally when they are rubbed off, and since experiments have proved that once they have bitten they become harmless, such an accidental change of host does not come into consideration in the propagation of the disease, at least in East Coast fever.

THE HOSTS OF THE TICKS.

From our point of view, it is all important to know which animal, in addition to those of which we have considered the diseases, may act as hosts for the ticks, and the following notes have been recorded concerning this:—

The blue tick has been found on equines and cattle, sheep, goats, dogs, and antelopes.

The red tick has been found to occur on equines, cattle, sheep, and goats, the reed-buck, other antelopes, and the Cape hare.

The brown tick has been found on cattle, equines, sheep, and goats, dogs, on various antelopes, the Cape hare, and the lion.

The black-pitted tick has been found on cattle, horses, sheep, goats, dogs, on the wild dog, the jackal, bushpig, and the hedgehog.

The bont tick has been found on cattle, horses, sheep, and goats, dogs, the wild dog, on antelopes, and the ostrich.

THE PREVALENCE OF TICKS IN THE VARIOUS REGIONS OF THE COUNTRY AND IN THE DIFFERENT SEASONS.

Generally speaking the ticks are more frequent in the summer than in the winter-time. This stands to reason, since a certain moisture and temperature is required for the process of hatching and

moulting. The various species related are, however, not equally distributed throughout the various parts of the country. We may state that the higher the altitude and the barer the veld, the less frequent are the ticks, hence the bushveld is practically the home of the tick, and the name "bosluis", as given by the Dutch farmer, indicates this. The blue tick may be considered as the most cosmopolitan tick of South Africa and is found at all altitudes. Next to it is the red tick, which is met with in the high veld, but less frequently. The group of the brown ticks, especially the brown tick proper, is rarely met with on the plateau of the high veld, but it may be found there in protected valleys where the vegetation grows higher.

The same applies to the black-pitted tick. The bont tick is limited to the bushveld proper and occurs only in places where the real bush is met with.

THE NUMBER OF TICKS IN PROPORTION TO THE NUMBER OF CATTLE.

Under the most favourable conditions the number of ticks increase directly to the number of hosts found on a farm; thus the more stock is kept the more the ticks will increase, and under such conditions the ticks may become so troublesome that, apart from their rôle as carriers of disease, they do enormous amount of damage by the withdrawal of blood from the stock and by the irritation they cause, which is generally known as "tick worry". Indeed, the ticks can kill an animal without even transmitting a disease. This we have seen in an experiment of ours, in which a horse was infected with blue ticks and which died as a result of this infestation, from acute anaemia, owing to the withdrawal of blood. Within three days 14-lb. weight of blue ticks were collected which had dropped off this horse, and this amount only represented about half of the ticks which engorged themselves on it.

INFLUENCE OF COLD.

We have stated that the presence of ticks is unequally distributed over high and low veld, and it may be expected that this fact finds its explanation through the temperature to which ticks are exposed in the high veld. Indeed, it is generally admitted that such is the case, and it may be so, for when such ticks as thrive best in the low veld are brought to the high veld by the removal of animals, the engorged females drop off, but do not develop there. But the cold in itself is not a barrier in prohibiting the development of blue and red ticks in the high veld, as experience proves; the temperature of freezing point only retarded the moulting of the nymphae into adults, but did not kill them; it did not affect the blue larvae at all; these latter only died when exposed for some time to a temperature considerably below freezing point.

ERADICATION OF TICKS AND DISEASE.

From a practical point of view we shall consider the two points separately, the eradication of ticks and consequently the eradication of disease.

The eradication of ticks can be attempted in several ways:—

1. *Burning of Grass.*—Up to the present time the burning of grass has always been considered to be of great help for the destruction of ticks, and it stands to reason that such must be the case. Farmers have always distinguished burning of grass in season and out of season, to which they attribute, if not properly carried out, the cause of various diseases, such as redwater and gall-sickness. I believe that these observations have a certain foundation. But, nevertheless, the great importance attached to it as the cause of disease is generally exaggerated. Burning of grass undertaken at a time when most of the ticks have hatched and moulted and are sitting on the top of the grass must undoubtedly destroy them.

We note that the principal tick season is the summer, and with the cold, tick life is more or less at a standstill. The ticks which, up to the end of the summer, have moulted and are sitting on the top of the grass, will still fasten themselves on to a passing host, and they are responsible for the tick life which we notice during the winter months. During the cold weather the laying of eggs and hatching is prolonged; if therefore at the beginning of the cold weather burning is undertaken, we would only reach those ticks sitting on the grass and not those which sit underneath. These latter would, under the influence of the sun on the bare veld, probably hatch quicker, and when the young grass is shooting up, they will be found on the top of this grass. When, however, the burning of the grass is undertaken later in the season it would probably destroy the majority of the ticks, and the later the burning is undertaken the better the results would be. But grass burning alone, although carried out in the proper season will not eradicate all the ticks—it only reduces their number.

Cattle which graze over the same veld maintain tick life, and ticks buried in the ground and not affected by the fire continue the cycle.

2. *Dipping.*—Dipping has been made use of, and is still being made use of, as a very efficient means of destroying ticks, and undoubtedly it is so wherever it is carried out properly with an effective dip. For our deliberations we accept the condition that the ticks will always be killed when the dip reaches them, and therefore we do not enter into the details of the efficiency of any particular dip, but consider the question of dipping as a whole. In valuing the effect of dipping, we must take into consideration the life cycle of the species of tick with which we deal, and from this we can determine whether a method of dipping will enable us to destroy certain species of tick or not.

We have stated that the *blue tick* requires three to four weeks for the completion of its life cycle on an animal. It follows therefore that one dipping within that time, say every third week, is quite sufficient to destroy the crop of ticks collected during that time. The blue tick larvae only live up to a certain number of months, hardly exceeding eight; within the eight months an animal would constantly

pick up these ticks, and by dipping, these would be destroyed, and finally the period would arrive when an animal no longer picked up blue ticks; the young larvae which have not reached a host would have died in the meantime. Thus dipping for the blue tick should have almost a certain successful issue, always provided that no tick escapes the dip.

Referring to the *red tick*, we find that in its cycle it seeks the host twice, once as a larva, from which it moults into a nympha and remains there for about sixteen to twenty-one days before dropping; the second time as an adult, the female remaining on the host from six to ten days. It follows from this that a three-weekly dipping would not reach all the stages, and if it would be of any use for the destruction of the tick it would have to be repeated after at least every eighth day. Dipping continued in this way during the period the nymphae, larvae, and adults live in the grass, would finally lead to their eradication.

The Group of the Brown Ticks.—For the completion of their life cycle they seek the host three times; as larvae they replete in from three to five days. The same period is required as nymphae, and the adult female requires about a week before it drops engorged to the ground. If the dipping is to be of any use for the destruction of brown ticks, it would have to be repeated every third day at least (*vide* footnote, page 504), and be continued as long as the intermediate stages can live in the grass.

In the case of the *bont tick*, which also requires three different feedings on an animal, the case is much similar to that of the brown tick. The larvae remain on the animal from about four to five days, the nymphae about the same period, and the adult about a fortnight. The dipping to be effective, therefore, would have to be done at least about every four days.

From the above notes it will be seen that dipping at long intervals is not effective for the destruction of the red, the brown, and the bont ticks. If dipping is to be of any use for the eradication of a disease transmitted by brown or bont ticks, dipping at short intervals is necessary. The intervals between dippings not to exceed the periods of attachment of the ticks on the animal; in order to catch all ticks, they would have to be as short as three days. In practice it has been proved that dipping at short intervals of five days can be continued for some time, but it is advisable to extend these periods to seven days, with intermediate hand-dressings of such places where the ticks live—depths of ear, sheath, anus, and brush. Such dippings have to be continued for at least the length of time an adult tick can live, viz., over a year.

In practice it so happens that during the first few months of dipping most ticks are destroyed, and it is therefore advisable to continue the dippings energetically at least during these months, since during summer-time all changes in tick life take place more rapidly, and ticks eagerly seek attachment on the cattle; this season ought to be selected for the dippings at short intervals. Most proprietary

dips have been adapted for short interval dippings. The one frequently used in Natal is that recommended by Pitchford, the proportions being:—

5½ lb. soft soap.
2 gallons paraffin.
8½ lb. arsenite of soda.
400 gallons of water.

Some farmers use arsenite of soda in the proportion of 1 lb. to 50 gallons of water for short dippings, and 1 lb. to 25 gallons of water for monthly dippings.*

3. *Starving the Ticks.*—The third method of eradication of ticks is the starving process, and this must undoubtedly lead to success in every case where we are able to keep the place, for a sufficient length of time, free of such animals to act as hosts. We note that the blue tick will only live about eight months, therefore keeping a pasture free of animals for this period must starve out the ticks. If it is our intention to rid a farm of red, brown, and bont ticks, this period must be extended to over a year. From observations made in connection with East Coast fever, where the freeing of an area from the disease is probably due to starving out of the ticks, it can be deducted that a safe period is fifteen months, and we can accept that this period will free any farm from tick life *under the conditions of no host having access to it.* If it is only the intention of freeing a farm of ticks to a certain extent, that is to say, reducing the number of them and not eradicating them completely, the precautions need not necessarily be so strict.

Stock brought on to the tick-free piece of ground will naturally bring with them the ticks again, and they will increase in the usual manner, and after a few months they will be present in great numbers. But if it is our intention to get completely rid of the ticks, precautions must be taken not to bring ticks with the cattle into the clean veld. This can be done by dipping or spraying the animals and immediately removing them on to the clean farm, but it can also be done without dipping and spraying. For this purpose the cattle should be placed on a smaller piece of tick-free ground, sufficiently large to carry them for about four to six weeks, and should be kept there for this period.

We will call this the quarantine paddock. During this time all blue ticks will have dropped off, and if it is only intended to escape these, the removal of the clean beasts into the final clean area can be done. Within four weeks, engorged larvae and nymphae of the brown and red ticks, which dropped off during the first days of the removal into the quarantine paddock, develop to a succeeding stage (nymphae or adult), in which they seek a new host, and these might be carried by the stock into the clean veld if this removal is done

* Recently Mr. Pitchford has amended his dip, so that it can be applied with safety every third day, the composition now being:—4 lb. arsenite of soda (80 % arsenic), 8 lt. soft soap, 1 gallon paraffin, 400 gallons water. Therefore, the theoretical postulate as referred to above now becomes a practical possibility.

later than four weeks after the introduction of the cattle into the quarantine paddock. It is therefore advisable to transfer the cattle after about eighteen days to an adjoining clean piece, where they must be kept for a further period of eighteen days; there the remainder of the blue ticks will drop off, and no new ticks can get on. The quarantine camps are then closed for all stock for at least fifteen months. After this period the stock can safely be moved to a clean area. It is also possible that by the same procedure the bont tick would be got rid of, so that, theoretically speaking, it is within the range of possibility—without the use of dips or sprays—to get rid of all ticks. In practice this would have to be carried out by splitting the farms up into fenced paddocks, on which, after the stated period of about fifteen months, the movement of cattle could be commenced.

ERADICATION OF DISEASE.

It is safe to conclude that the eradication of ticks means the eradication of disease. How this can be done has just been demonstrated.

East Coast Fever.—Prevention of East Coast fever by means of dipping is therefore possible, provided that the dipping has been carried out energetically enough and for a sufficient length of time before the disease has been introduced on a farm, and the chances of saving cattle from the infection stand in direct proportion to the number of ticks thereon.

Under the conditions where the disease has broken out and no tick-free area is available, dipping may still be of some use, provided that the first case of East Coast fever has been immediately recognized, and provided that the infected animals are prevented from disseminating ticks broadcast over the pasture. Under such conditions, unless the sick cattle are immediately killed, all cattle, sick and healthy ones, must be dipped at the shortest possible intervals. The ticks off sick cattle will find their host, and communicate the disease before they can be killed, but once the crop of ticks off the first infected cattle previous to dipping has been caught, the disease must stop again.

When the disease has taken a firm hold on a farm, that is to say, a number of cattle sickened and died and disseminated ticks in large numbers, then no dipping will help to stop the disease, simply because in order to destroy such infected ticks they must attach to a host, which they naturally will infect if such host happens to be cattle. Under such conditions another method has to be applied, namely, that of moving the stock out of the infected area into a non-infected one, arranging the movement so that the ticks which carry the infection, and the animals which are infected, remain behind. But this method can only be applied in those diseases where the immune animals do not act as a reservoir, such as in East Coast fever and heartwater.

Accordingly, wherever possibility exists of the spread of East Coast fever, the following precautions should be taken: The cattle should be grazed on one particular piece of the farm and not indiscriminately all over; another part should be fenced off and under no

conditions should cattle be kept there. Should East Coast fever now break out, the following procedure should be adhered to. Collect all the cattle and bring them on one particular place of the clean ground which has sufficient grass to feed these animals for about twenty-one to twenty-four days. In this camp the careful selection of sick and healthy animals takes place. The sick animals are killed or sent back to the infected ground, and the healthy animals remain.

In order to detect the sick animals early enough, recourse should be taken to the thermometer, and all animals with a high temperature should be considered infected and turned out of the camp. Another twenty-two to twenty-three days, the remaining healthy animals can now be moved into the clean area; they leave ticks and infection behind The reason for this latter movement will find its explanation in the following facts. The average incubation period of East Coast fever is thirteen days, the longest (quite exceptional) twenty days. The average duration of the disease is twelve days, the longest twenty days (quite exceptional). Within twenty-two to twenty-three days it must therefore be possible, by means of the thermometer, to detect all infected animals. We have stated that the brown tick communicates the disease in either the nymphal or adult stage. For moulting it requires at least sixteen days, but an average period of twenty-four days. We have to reckon with the sixteen days, and we know that usually after the moulting another eight days elapse before such ticks are able to reach the top of the grass and to bite; of this fact advantage must be taken to remove the cattle out of the area before these ticks are ready to bite, and that is about twenty-three days after moulting. The period of moulting in the red tick nymphae is about twenty-four days, and here no danger would be expected. But even without thermometers, the moving of cattle is possible, namely, by making use of two quarantine camps, as explained before, leaving the animals in each camp for eighteen days. In thirty-six days all infected animals would have become visibly sick and could be excluded. Of course it is then advisable to dip the cattle in the clean area.

Heartwater.—If we want to trek out of a heartwater infected area, for the purpose of saving the stock not yet infected, two ways are open, depending upon what ground is available and whether such ground is infected with bont ticks. Moving out of the infected area into ground where no bont ticks are present means that the disease must stop.

This has been the experience of many bushveld farmers who, with their stock, went down to the low country, and when troubled with heartwater simply moved back again to higher-lying ground. The fact was known for a long time, but the explanation could not be given since no connection between tick and disease was surmised. If, however, no ground is available free from bont ticks, then the same procedure has to be resorted to as explained in the case of East Coast fever. Moving on to a place which is known to be free of heartwater, remaining there just over the incubation period of the disease, and

moving out of it before the ticks which dropped have moulted, and are capable of attaching themselves, for which two quarantines of three to four weeks each will be sufficient.

ERADICATION OF DISEASES IN WHICH THE ANIMAL ACTS AS THE RESERVOIR OF THE VIRUS.

This applies to ordinary redwater, biliary fever in horses, and to gall-sickness. Should any of these diseases break out amongst a lot of cattle and we want to try and save the majority of them by removing them out of the tick-infected area, we can only stop the disease if we move into a tick-free area, leaving all ticks behind. Then the disease must stop. This is hardly possible under present conditions, and when we move the animals out of a tick-infected area into an area free of the disease but tick-infected, we only postpone the appearance of the disease, but will not completely escape it. As soon as the sick and the immune animals reach the new area they will infect the ticks on that area, and after the period of hatching or moulting, as indicated above, the disease will continue.

The question arises whether it will be possible to breed stock free of biliary fever as regards horses, of redwater and gall-sickness as regards cattle; we must emphatically say that it is possible if we start with a farm where, by previous starvation, as indicated above, all ticks have been killed, and where all hosts of such ticks are kept out by fencing, or where all ticks have been destroyed by dipping. Farming with imported horses and cattle which have never suffered from biliary fever, redwater, or gall-sickness is even possible, with the presence of ticks, provided that no such animals are on the farm which can act as a reservoir of the virus (immune horses and cattle). In other words, ticks may be allowed on such a farm if they have no chance of becoming infected. Naturally, such animals should never leave the place. They would contract the disease as soon as they were put into the veld where breeding of stock is not carried out under the same conditions. Breeding of stock free of infection from already infected stock can only be carried out under the conditions of absolutely excluding all tick life. It would have to be started by moving the stock through quarantine camps into an area previously cleaned of ticks, but in this case the ticks would, by all means, have to be kept out as long as the original lot of animals (the reservoirs) were present, because ticks introduced by any other kind of hosts would become infected with the disease of the immune animals, and in turn would communicate the disease to their progeny.

Thus, theoretically speaking, it would be possible to clean an area of ticks and to breed stock free of diseases out of imported and immune stock. The question now arises, would this be of any advantage at the present time? If one farmer carries out all the precautions and renders his farm absolutely free of ticks and thus breeds animals free of disease, it would mean that such animals have no immunity against the diseases mentioned, and would contract them as soon as they were removed into an infected area.

Unless the eradication of ticks throughout the whole country is undertaken it appears that it is not advisable to go in for destruction of all tick life. This is a theoretical deduction, as ticks are necessary to maintain the immunity against the various diseases, by inoculating the young stock, which recover from the effect of the infection. This, however, should not debar a farmer from putting up a dipping tank or going in for any other sort of tick eradication, since there will always be a number of ticks left and by the movement of stock to and from a farm, a further number will be reintroduced. Even if no movements off the farm are undertaken, except for the purpose of selling cattle which are intended for breeding purposes, there exists a way out of the difficulty, viz., by inoculating such stock against these diseases.

The notes given above will be useful in themselves to indicate to farmers how they can reduce the number of ticks. Theoretically speaking, from the possibilities as explained above, united action throughout South Africa would enable the country to be freed from such diseases as are carried by ticks. Perhaps a future generation will see the advantage of doing so.

Although we most emphatically advocate the destruction of tick life, and although we admit that if it would be carried out as energetically as we have indicated here it should be, yet we wish to warn farmers not to trust to it as a panacea for the prevention or eradication of East Coast fever if to it alone recourse should be taken. No dip has yet been found which prevents ticks from biting, and as long as infected ticks are present, so long East Coast fever will be found. Accordingly, dipping only comes in as an auxiliary measure; true, a powerful one. All such other measures as stopping movements of infected cattle and fencing are of primary importance; if these are thoroughly carried dipping will become effective, and it will then be of lasting value, if it is so carried out that all ticks are destroyed.

Crotalaria Burkeana and other Leguminose Plants causing Disease in Stock.

By JOSEPH BURTT-DAVY, F.L.S., F.R.S.S.A., Government Agrostologist and Botanist, Transvaal.

Crotalaria burkeana Benth., family Leguminosae, is a native of the Transvaal, and has for many years been recognized by stock farmers as the cause of a disease of stock known as stijfziekte; in fact the plant is known in the vernacular as the "stijfziekte bosje". It is also called "klappers" from the character of the somewhat horny pods in which the seeds rattle about. I called attention to the dangerous character of this plant in my annual report for 1903-04 (1).

Symptoms.—The following reports have been furnished as to the symptoms produced by feeding on Crotalaria. "It is said to paralyse or stiffen the limbs of cattle" (14). "About five days after a beast has eaten this plant it becomes very stiff in its joints and frequently is unable to stand. It is not fatal, however. A further development takes place in that the hoofs begin to grow, until at times they break off, making oxen almost useless for trekking for a long time" (13). "After eating these bushes cattle become almost too stiff to walk, and, in many bad cases, after some time they are not able to stand on their legs. In all cases, except when very mild, their hoofs grow long and make it very awkward for them to move about" (15). "The animals get perfectly stiff in their fore legs, and, if not attended to, will lie down and are unable to rise again" (16). The cause of lameness is not stiffness of the joints, but laminitis, i.e. inflammation of the sensitive laminae (17).

Stock not always affected.—In the Hoopstad District cattle appear to graze among Crotalaria without being in any way affected by it, year in and year out (19). A Free State farmer reports that the plant does not affect cattle that are used to it (21).

No effect on Goats.—It is stated by farmers that this plant has no effect on goats (20). A similar fact has been noted in the case of *Cytisus proliferus* in the Canary Islands (6).

Local remedies.—Although they are often empirical, it is well to take note of local remedies, as they sometimes throw an indirect light on problems. "The only thing that I have noticed helps them a little is to outspan as soon as one sees that they are affected. I should be very pleased to get some remedy" (15). The farmer is fond of homoeopathic remedies, and this disease is no exception to their rule that "like cures like"; one correspondent wrote that "as a cure the same shrub is taken and boiled in water, a sufficient quantity to fill a quart bottle is given, and they are right in a few days". Another reported that a good remedy is to make the beast swim several times, after which it gradually gets better. One tablespoonful each of turpentine, paraffin, and raw linseed oil has also been recommended (18).

Feeding tests.—Difficulty was experienced in securing enough material for a feeding test; when at length sufficient was obtained, it was sent to Dr. Theiler. Six and a half pounds of the dried plant

were fed to four bastard sheep under the supervision of Government Veterinary Surgeon Johnston in April, 1906, but no results were obtained. The material was somewhat mouldy, having been delayed in transit from the Free State. Mr. Johnston suggested that the toxic properties might have escaped during the process of evaporation, which reduced the weight of the parcel from 10 lb. to 6½ lb. In the case of *Crotalaria sagittalis*, however, the dry hay is equally liable to cause disease. It seems possible that the bastard sheep is, like the goat, more or less immune to some toxins, as was suggested at the time by Stock Inspector Everitt.

Reports from farmers continued to reach us that this plant caused loss of stock. Owing to the fact that other species of Crotalaria in other parts of the world are known to cause death, I felt confident that there was some foundation for the suspicion under which our plant was held by the Boers. I therefore determined to have a further test, but difficulty was again experienced in securing enough material. In April, 1910, however, about 12 lb. was collected by Mr. W. F. Williams, Vogelsrand, Ventersburg Road, Orange Free State, and sent to Dr. Theiler. This was fed to an animal, but without result, which seems to indicate that there is a loss of toxicity in the process of drying, but it may have been that the quantity fed was insufficient, and the feeding not continued for a sufficient period.

In the meantime, however, the Government Veterinary Surgeons at Zeerust and Barberton, working under Dr. Theiler's direction, had succeeded in producing the disease stijfziekte by feeding animals with fresh material of *Crotalaria burkeana*. Specimens of the plant being fed were submitted to me from time to time, for identification. It having been proved that the plant is the cause of the disease, some account of its habit of growth and distribution may be of use to veterinary surgeons and farmers.

Description of the Genus.—The genus Crotalaria of Linnaeus belongs to the family Leguminosae, sub-family Papilionaceae, and the tribe Genisteae. It differs from other South African genera of this tribe in the following points:—The leaves are either simple or are "palmately compound", i.e. produce several (3, 5, or 7) leaflets from the top of a common leaf-stalk (the *petiole*); the leaves usually produce *stipules* (i.e. little bract-like organs at the base of the leaf); the keel of the pea-shaped flower is sharply beaked; the flowers are produced in *racemes* or are scattered on the stalk, but are not collected into heads as in the case of the clover; the pods are inflated. The technical description is as follows:—Calyx sub-bilabiate, the upper lip bifid, the lower trifid. Vexillum large, cordate; carina falcate-acuminate. Stamens monadelphous. Ovary 2 or many ovuled; style elongate knee-bent, often laterally pubescent. Legume turgid, with very convex valves, sessile or stipulate, few or many seeded.

The Crotalarias are either herbs or shrubs, and are common throughout the tropics and sub-tropics of both hemispheres. Leaves either simple or palmately 3, 5, or 7 foliolate, commonly stipulate; bracts and stipules sometimes wanting. Flowers either racemose or sub-solitary, but not umbellate. Some species of Lotononis, especially in the section Oxydium, approach Crotalaria in the form of the corolla, but differ by their umbellate inflorescence and unswollen pod. In other Lotononides, when the pod is more turgid, the carina is not sharp.

Twenty-four species of Crotalaria are described in the *Flora Capensis* (1862), of which seven occur in the Transvaal. Four species not described in the *Flora Capensis* are now found in the Transvaal, of which two belong to the Tropical African flora.

Description of C. burkeana.—This species belongs to the section Racemosae, having leaves digitately 3 to 5 foliolate, and racemes mostly terminal and densely or laxly many-flowered. It differs from other species of this section by the small, subulate stipules; narrow lanceolate, acute leaflets; long calyx-lobes; and densely hispid branches and petioles; variety *sparsipila* is, however, much less hairy.

C. burkeana Benth. (Plate 1).—Herbaceous or suffruticose, erect; branches, petioles, and racemes densely hispid, with long, spreading, rusty hairs; stipules linear-subulate; leaflets 3-5, linear-lanceolate, acute, glabrous above, pilose beneath; racemes terminal, lax, several-flowered; bracteoles lanceolate; calyx deeply cut, its segments lanceolate, nearly as long as the corolla; legume sub-sessile, oblong, very hairy.

Var. *sparsipila* Harv.—Much less hairy, with larger petioles, leaflets, and racemes.

A perennial herbaceous plant, one to two feet high, woody at base, with many herbaceous, slightly branched stems, freely covered with stiff, harsh, rusty-brown hairs. *Petioles* (leaf-stalks) 1 to 1½ inches long, leaflets as long, often 5 together, 1 to 2 lines wide, acute at each end. Racemes produced on peduncles, terminal, 10 to 15 flowered. Flowers pea-shaped, yellowish, with purplish-brown veining, about ¾ inch long. Pods 1½ inches long. Var. *sparsipila* is a more luxuriant and less hairy form, and probably grew in richer, alluvial soil.

Type locality.—The type locality for *Crotalaria burkeana* is the Magaliesberg, at the Aapies River, doubtless on the north side of the Wonderboompoort, where it was collected by Burke and Zeyher about 1832. The type of variety *sparsipila* was collected in Zululand by Miss Owen.

Distribution.—In the Transvaal, *Crotalaria burkeana* is most abundant in the south-western region, including the Districts of Bloemhof, Wolmaransstad, Western Potchefstroom, Marico, and Rustenburg. It has also been collected in the Pretoria, Zoutpansberg, and Barberton Districts, and may be expected in the Lichtenburg, Waterberg, Middelburg, and Lydenburg Districts.

In the Orange Free State it occurs in the Boshof, Hoopstad, Kroonstad, Heilbron, and Winburg Districts.

In the Cape Province it is found in Griqualand West and British Bechuanaland, in the Districts of Barkly West, Herbert, and Vryburg.

In Natal it is recorded for Durban County, and there is a solitary record from Zululand.

Localities.—The following localities are recorded and mostly represented by specimens in the various herbaria. I am indebted to Dr. Bolus, Mr. Medley Wood, Mrs. Leendertz Pott, Dr. Schönland, and Professor Pearson for lists of the specimens preserved in the herbaria under their respective controls.

Barberton District.

Macsvale, 24th January, 1907. W. P. Macpherson in T.D.A. herb. 3298, letter 3715/B.161/84.

Barberton, July to September. E. E. Galpin 405 in herb. Bolus; Thorncroft in T. M. herb.; Bolus.

Near Barberton, 4th January, 1909. G.V.S. Turnbull in T.D.A. herb.

Barkly West District.

Fourteen Streams (reported).

Bloemhof District.

Kromellenboog, by roadside, rare; "said to poison stock". 2nd December, 1904. Burtt-Davy 1494 in T.D.A. herb.

Elsendale, Christiana (seeds ripe), 19th April, 1907. H. G. Mundy in T.D.A. herb. 4324.

Elsendale, Christiana (in seed), November, 1908. Burtt-Davy 5542.

Christiana Town Lands, May, 1910. Burtt-Davy 8068. Holwater, 1909; teste F. J. Few.

Bloemhof, 15th February, 1907. "Causing stijfziekte." C. C. Campbell in T.D.A. herb. 3348.

Vecht Vallei, P.O. Abel's Kop, Schweizer Reneke. Teste F. O. Mallett in litt., 13th May, 1910.

Bloemfontein District.

Specimen from O.F.S. Department of Agriculture, locality not stated; 24th February, 1906. T.D.A. herb. 1689.

Boshof District.

Reported as occurring on several farms bordering on the Vaal River.

Griqualand West Division.

Between the Vaal and Kuruman, July. Cruickshank in herb. Bolus 2516.

Heilbron District.

Parys. W. R. Dewar (*ex* Botha No. 3). 8th March, 1905.

Herbert District.

Douglas. Miss Orpen in herb. Bolus.

Hoopstad District.

Mr. C. McG. Johnston, of the Orange Free State Department of Agriculture, reported that on several farms in the Hoopstad District he had seen a fair quantity of *Crotalaria burkeana*.

Specimens were received from Stock Inspector Everitt, Hoopstad, 27th March, 1906 (farm not stated).

Willow Dam, Bultfontein, March, 1904 (in seed). A. W. J. Atkinson in T.D.A. herb. 77.

Middenin, Bultfontein, 1910 (21).

Kroonstad District.

Gelykvlakte, via Klerksdorp, 1904. B. J. Marshall.

Marico District.

Near Zeerust, G.V.S. Evans.

Natal.

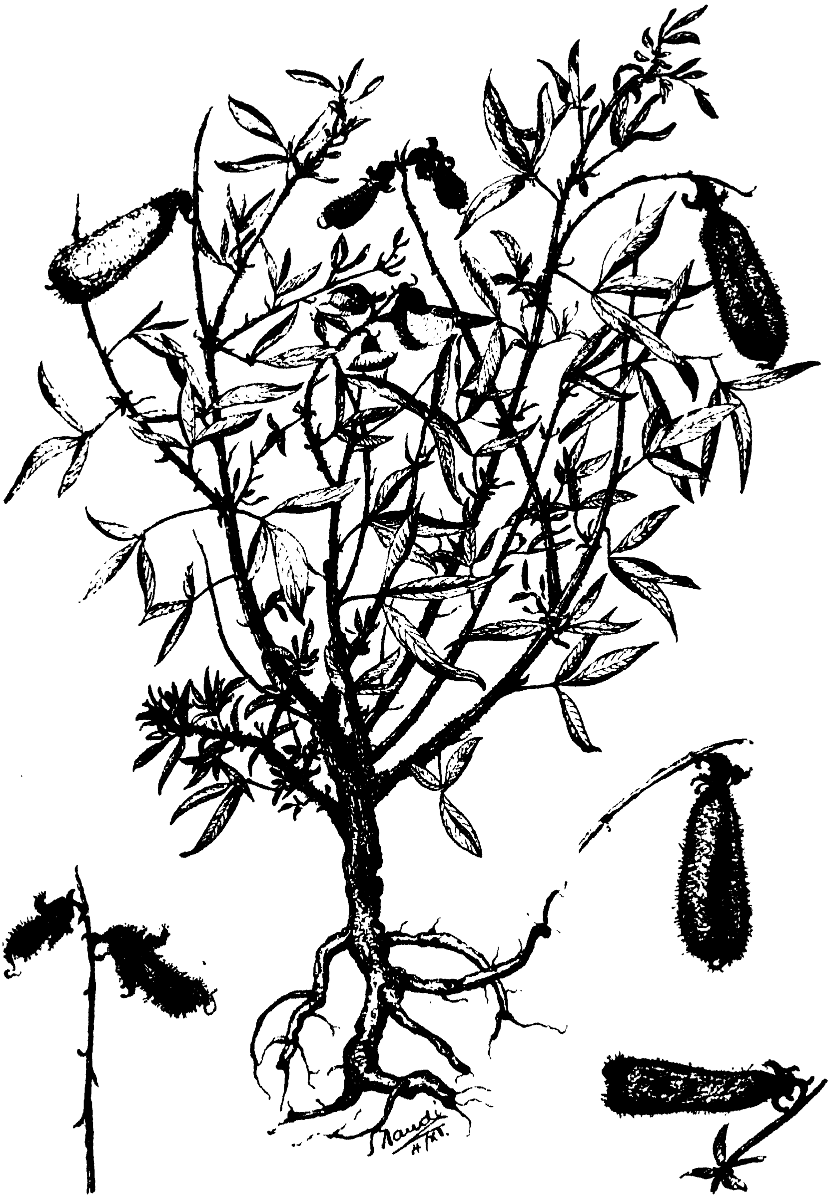
Durban, March. Medley Wood 559; 913 in herb. Bolus.

Potchefstroom District.

Machavie (ripe pods), 9th February, 1904. Burtt-Davy 1485.

Reported as common near Klerksdorp.

Potchefstroom, October. McLea in herb. Bolus.



Crotalaria burkeana, the Stijfziekte Bosje.

This drawing has been specially made to enable farmers to recognise this plant for themselves. It is about two-thirds the natural size of the original specimen.

Pretoria District.

Magaliesberg, at the Aapies River. 1832 (?) Burke and Zeyher (type).

Rustenburg District.

Kosterfontein, "on a single ironstone kopje only". Specimens sent by a correspondent in 1904.

Swaziland.

Bremersdorp. Bolus 11,784 in herb. Bolus.

Vryburg District.

Near Vryburg (several specimens).

Winburg District.

Vogelsrand, Ventersburg Road, 12th March, 1910. W. F. Williams in T.D.A. herb. 5841.

Wolmaransstad District.

Said to be common in the district. G.V.S. Dale reports a farm on which about twenty cases of Crotalaria poisoning occurred in June, 1910.

Leeuwdoorns. S. J. Hyde, 9th February, 1909 (plants in seed; seeds sown at Skinner's Court).

Zoutpansberg District.

Tzaneen, August, 1905. Pole-Evans in T.D.A. herb. 4013.

Pietersburg. Schlechter in T.M. herb. and herb. Bolus.

Frischgewacht, Ysterberg. Mrs. Leendertz Pott in T.M. herb.

Near Pietersburg, *cir.* 4000 ft., February, 1904. Bolus in N.G. herb.

Vaalboschfontein, 4400 ft., January. Schlechter 4234 in N.G. herb. (District not stated; probably in Zoutpansberg.)

Zululand.

Type locality of var. *sparsipila*: Miss Owen, teste *Flora Capensis.*

Soils.—*Crotalaria burkeana* is most common in sandy soils, and is often to be found in silt along the roadside. G.V.S. Dale, of Potchefstroom, reports that in some parts of the western portion of his district it is especially common on old lands; it is found that even if it exists in the unbroken veld in such small quantity as to be harmless, as soon as land is cultivated, and maize or kaffir corn planted, the Crotolaria makes its appearance along with them.

Season.—Growth begins about October, or with the spring rains, according to locality. At Leeuwdoorns it does not appear till December (Hyde). The plant is said to be most poisonous when the pods have developed, which is usually about the end of January or in February (13). In the Barberton District cattle do not appear to be affected until about January (17). It is cut to the ground by severe frost, and, being brittle, soon breaks up and disappears. By the end of May, it is often difficult to find any, even in localities where it is usually abundant. In some years it has disappeared by the end of March. The Assistant Resident Magistrate, Klerksdorp, writing under date 20th January, 1904, reported that the plant was said to be at its worst about that time.

Other Plants causing Neuritic Troubles.—The late Professor MacOwan, Cape Government Botanist, came to the conclusion that there had been a serious confusion in the farmer's recognition of the

disease, and that a large number of cases of reputed stijfziekte have been nothing more than tympanitis, that is, "opblaas" or "hoven". The real stijfziekte or t'nenta, he points out, is certainly an acute form of neuritis, and is attended by distinct lesions of the terminal portions of the nerve structures of the extremities. Here, again, there appears to have been some confusion between true neuritic stijfziekte and "lamziekte", which latter Professor MacOwan considered to arise from the absence of sufficient calcic phosphate in the food to properly solidify the bones (6). It is interesting to note that the general distribution of the disease called gal-lamziekte synchronises with the region of the greatest abundance of *Crotalaria burkeana.* But it should not be overlooked that Crotalaria extends farther east than gal-lamziekte is known to occur, and that Crotalaria does not appear to grow in some parts of the Cape Province where that disease occurs. Other species of Crotalaria are likely to occur there, however. Mr. B. Burger notes that his stock are not troubled with lamziekte as regularly as with stijfziekte; some years the former is severe, and in others not so bad. Moreover, lamziekte generally results in death, while animals usually recover from stijfziekte.

MacOwan points out that various forms of this neuritis occur in different countries, but that their correlation does not admit of doubt. The symptoms show small differences such as are to be expected when the species and genera of the plants eaten are not exactly the same.

Crotalaria sagittalis L. ("Rattle-box.")

In the East and Central United States this plant is known to be poisonous to stock, producing a disease called "crotalism", or "Missouri bottom disease", because of the prevalence of the plant along the Missouri River bottoms of Western Iowa. The plant is poisonous not only green, but also in dried hay.

Poisonous principle.—An unnamed alkaloid has been isolated from the seeds by Dr. Power, but Chestnut states that the poisonous principle is unknown, and that it occurs both in the leaves and the seeds. Horses and sometimes cattle are killed by eating grass or meadow hay in which the plant is mixed. They are not poisoned so often by eating the plant in the field. Dr. Stalker, of Iowa, in 1884, while investigating the cause of "bottom disease", then prevalent among horses in Iowa, was led to believe that it was mostly if not always due to this plant. Extracts were prepared which, when fed to young horses, produced analogous symptoms and death. The pronounced symptoms from a moderate dose were great stupor and loud, heavy breathing. A larger dose caused death in one and one-half hours. Small doses repeated daily induced the characteristic stupor on the fifth day, and death on the thirteenth (3).

Symptoms.—As generally described from accidental cases, the symptoms are much more prolonged, death resulting only after several weeks or months. There is a general decline of vigour, and a gradual loss of flesh, as observed in the case of loco, with which this plant is closely related. The rattle-box does not, however, appear so often to produce the craziness characteristic of loco.

Antidote.—No antidote has been suggested, but Dr. Stalker states that provided the animals are given a proper and nutritious diet,

they will be greatly benefited by daily doses of 2 ounces of epsom salts, with 2 drachms of sulphate of iron and 1 drachm of nux vomica.

Eradication.—Chestnut recommends burning the veld at the time of the seeding of *Crotalaria sagittalis*, which, he claims, will materially reduce the percentage in the veld hay cut the following season (3).

Crotalaria alata Hamilt.

A native of India, is suspected of poisoning stock in Queensland (9).

Crotalaria mitchellii Benth. ("Yellow Darling Pea.")

A native of South Australia, New South Wales, and Queensland; is supposed to produce the same effect on cattle as Swainsona (10).

Swainsona galegifolia, R.Br. ("Darling Pea", "Indigo.")

In Australia this plant is well known to be poisonous to stock. Most of the cases of poisoning by it are said to occur in the dry season, when stock are especially attracted by green and succulent foliage, and are more likely to gorge themselves upon a single species which remains green, if found in fair abundance.

Physiological action.—Professor Martin has investigated the action of *Swainsona galegifolia* on sheep, and finds that its effects are similar to those produced by slow poisoning with alcohol and certain toxic proteids, resulting in peripheral neuritis and degeneration of the nerve endings, accompanied by a loss of muscular control. The action is a slow one, four to six weeks being required to produce serious symptoms. If at once put on a proper diet, recovery takes place, but not if paralytic symptoms have supervened. Young lambs probably respond more rapidly to the poison; when the symptoms are fully established there is no remedy (5). Experiments on frogs indicated that Swainsona possessed very powerful sudorific properties, reducing them in a few hours to mere skeletons (11).

Bailey describes the effect on sheep eating the plant as follows:—They separate from the flock, wander about listlessly, and are known to the shepherds as "pea eaters" or "indigo eaters". When once a sheep takes to eating it, it seldom or never fattens, and may be said to be lost to its owners (11). In 1873 a Mr. Charles Thorn tested this plant on a lamb which had become an "indigo eater"; it was placed in a small paddock, where it refused to eat grass; Mr. Thorn collected a quantity of indigo plant, which it ate greedily, following him all over the paddock and eating it out of his hand (11). Horses which had been feeding on Swainsona were exceptionally difficult to catch; their eyes were staring out of their heads, and they were prancing against trees and stumps. The second day two out of nine died, and five of the rest had to be left behind. When driven they would suddenly stop, turn round and round, and keep throwing up their heads as if they had been hit under the jaw; they would then fall, lie down for a while, rise, and repeat the performance (11).

LOCO WEEDS.

In California, Colorado, and other Western States of America, a neuritic disease, ending in hallucinations and death, is produced by eating several species of the leguminose genera Astragalus and Oxytropis. In Texas, *Sophora secundiflora*, also a legume, is the cause of "locoism".

Lessertia annularis Benth. ("T'nenta.")

Professor MacOwan pointed out that this leguminose plant, when in full bearing of its crop of pods and ripening seeds, was a cause of true neuritic stijfziekte in the Cape Province. A lesser amount of suspicion, he adds, rests upon several common species of Indigofera and Tephrosia (6).

Melolobium candicans, Eckl. & Zeyher.

This plant was also reported by Prof. MacOwan as suspected at the Cape of causing t'nenta poisoning in small stock (6).

Cytisus proliferus Linn. f. ("Tagasaste.")

If eaten when in pod, this plant is said to intoxicate horses (6).

Lathyrus sativus. ("Muttar.")

The dried peas of this plant have been known to poison a whole stud of omnibus horses, the symptoms being analogous with the forms of neuritis already mentioned (6 and 8). A disease called "lathyrism" appeared among Russian peasants in 1891 after feeding on bread made of the muttar pea when wheaten flour was unobtainable (6). Church states that the paralysis induced in horses, bullocks, as well as in man, by the free use of these seeds is beyond dispute (12).

REFERENCES.

1. *Burtt-Davy, J.*—Plants, Poisonous and Otherwise Injurious to Stock. Transvaal Department of Agriculture Annual Report, 1903-04, pp. 316-317.
2. *Burtt-Davy, J.*—Stijfziekte Bosje. *Transvaal Agricultural Journal*, Vol. 3, No. 10, p. 308 (January, 1905).
3. *Chestnut, V. K.*—Principal Poisonous Plants of the United States (1898).
4. *Pammel, L. H.*, and *Fogel, Estelle D.*—A Catalogue of the Poisonous Plants of Iowa (1909).
5. *Ewart, Prof. A. J.*, and *Tovey, J. R.*—The Weeds, Poison Plants, and Naturalized Aliens of Victoria (1909).
6. *MacOwan, Prof. P.*—Letter in *Transvaal Agricultural Journal*, Vol. 3, No. 9, pp. 133-135, October, 1904.
7. *Maiden, Prof. J. H.*—The Useful Native Plants of Australia (1889).
8. *Watt, Dr. Geo.*—Dictionary of the Economic Products of India.
9. Queensland Department of Agriculture Report, 1891-92, p. 49.
10. *Maiden, Prof. J. H.*—Plants reported to be Poisonous to Stock in Australia (1897).
11. *Bailey, F. M.*, and *Gordon, P. R.*—Plants reputed Poisonous and Injurious to Stock (1887).
12. *Church, Prof. A. H.*—The Food-Grains of India (1886 and 1901).
13. Letter from *Mr. Richard Kemp*, a resident of the Wolmaransstad District for ten years prior to 1894.
14. *Mr. J. N. Manold*, Lichtenburg, *viva voce*.
15. *Mr. B. J. Marshall in litt.*
16. A correspondent at Kosterfontein, Rustenburg District.
17. *G.V.S. Turnbull in litt.*
18. Letter 4923 of 25th April, 1910.
19. *Mr. C. McG. Johnston in litt.* 734 of 23rd April, 1906.
20. Letter 818 of 9th May, 1906.
21. Letter from Mr. B. Burger, Middenin, Bultfontein, Orange Free State.

Sheep-Breeding.

[*Lecture delivered by W. M. McKee, Government Wool Expert (Cape Province), to the Beaufort West Farmers' Association*].

The president informed the meeting that the Government Wool Expert (Mr. McKee) was present and had kindly consented to give them a lecture. It was not necessary for him (the president) to introduce Mr. McKee, for many of them had the pleasure of meeting him on a previous occasion. He would simply call upon him to address the meeting.

Mr. McKee (who was received with applause) said that of all the domestic animals the sheep responds most quickly to judicious selection and breeding, but at the same time deteriorates even more quickly if neglected or treated in a careless way.

Our most successful breeders in the world are men who have had a single ideal in breeding to work for and have stuck to that ideal, and have not been influenced by any other outside inexperienced advice. In breeding sheep a great many disappointments occur, but we can profit by them, so it is not a dead loss. If we look back 100 years to the reports and samples of wool and sheep of that time and compare them with the merino sheep of to-day, we see a vast improvement. This has been accomplished by careful breeding, mating and selection, together with the help of the climate, pasturage, and nature.

Our one aim at present in sheep-breeding is to get the greatest weight and quality of fleece from the sheep and a large carcass for the butcher, and in striving for this one is very apt to forget that the country whereon these sheep are depastured will not carry this high-class remunerative animal. The sheep cannot be expected to reach perfection unless the most favourable conditions prevail, but we can try to get as near perfection as possible, as far as the conditions of the country permit. Again, it is not every man that is a genius and successful in breeding the highest class stock, which is perhaps as well, otherwise the monied man would soon crowd out the brainy man by sheer monetary outlay. It is only through hard study and constant observation that any intimate knowledge of the art of breeding and rearing stock can be carried to a successful issue. The ancients seemed to thoroughly understand the art of mating and breeding to produce the class of stock which they had in the earliest days of the Roman Empire. For generations back the stock has been gradually improved, except when war devastated the countries and threw breeding back. Now it is the great care of all the breeders to maintain their sheep at their present standard of excellence.

Remember that there is no royal road to success in sheep-breeding, but that the ideal can only be reached and held by means of patience, knowledge, and diligence.

In South Africa it has been the custom to buy high-priced rams from different type breeders. Now the Vermont type is different from the Wanganella type, and the Delaine type from the Tasmanian type, although all are pure merinos and descended from the Spanish sheep, for they have, owing to different climate and treatment developed certain distinct characteristics. Farmers rarely recognise this, but it makes a big difference in the uniformity of the flock an

wool. If those types now fixed are crossed in a careless way they suffer in uniformity. Each type gives different classes of wool, used for the different trades, so it does not do to mix them, although they may in some instances breed a few first class sheep. It is not advisable to breed from rams which are practically made up of two or three different types and which will not throw true to one type. To fix a type takes from eight to twenty years. If we use mixed type rams, a mixed strain is sure to be the outcome.

One cannot but wonder where the progeny of these high-class mixed type rams are as they are seldom exhibited at the shows. I am speaking now of rams bred of two types—say the Vermont and Wanganella.

Again, purchasing an expensive pure type sire where the ewes are not worthy of such a classic sire is waste of money. Better buy several lower grade rams for the same price and gradually work up the ewes so that they will give the full result from a good sire. Changing about with different types is a plan often adopted as a short cut to the front rank of sheep-breeding, but in 99 cases out of 100 the result is failure.

The greatest point to be secured by a breeder is fixity of type, blood, and prepotency, and this can only be obtained by years of work, unless the original stock was pure and true to type without any admixture of other types. No two breeders have exactly the same ideal, so when a stud changes hands the ideal changes, with the result that there is a set back; different lines are followed, which may cause the stud to lose its individuality, and there will be a certain decadence in character and breeding, while years may pass before the new methods will bear fruit.

Nearly all breeders have a few practical characteristics noted in their own sheep, so if a stud is to improve the same man who starts breeding a type should continue to do so until he has worked out his ideal. It is a pity to have a good stud spoilt by handing it over to a new man.

At present there are two classes of sheep, and sometimes an intermediate one, in the flocks of some of our leading farmers—the wrinkly sheep with coarse hairy hindquarters and neck and the sheep with the plain body carrying fairly good wool. The intermediate is the sheep having just the apron or fold in front and a smaller amount of hairiness. Now what we want is sheep all of one type in our flocks.

The merino sheep of to-day is to all intents and purposes an artificial animal, with a natural tendency to depreciate in quality, covering, and constitution, and quality of fleece. Therefore in order to keep up the requisite standard it is advisable to select as sires animals of an exaggerated type of what is required in the flock. This is especially the case if a farmer has inferior ewes to work upon, with marked deficiencies in their character. In the south-western districts, for example, the wool is light in condition and only 3 to 5 lb. of wool per head is obtained from the ordinary flock sheep. This is the result of the farmer neglecting to obtain an exaggerated class of ram to keep up and improve the standard and weight of wool of his sheep. In the Eastern Province from 7 to 10 lb. of clean wool is obtained per sheep, and this result has been obtained by using an exaggerated type of ram to mate with the flocks. In all cases it is necessary to use rams of a more pronounced type than the ewes, for then the progeny will gradually improve.

A ram with a slight tendency to one or two folds on the neck, a good broad square tail, full neck, broad shoulder and rump, well covered with wool all over the body, and with a good constitution, may give what is required in these ordinary flocks. In order to breed flock rams having two or three folds and a broad tail it is necessary to use sires having these characteristics most marked to ewes with similar points but not so pronounced, then the stud breeder can keep himself supplied with the sires he requires for his own flock, and sell some as flock rams. In addition to this he may require a special stud ram even more marked than the second class studs. These sheep of the higher class of studs may be wrinkly, and would be unsuitable if put directly to the ordinary flock on account of the violent extremes, but when the progeny are toned down (i.e. lose the wrinkles through two or three generations) they would then be suitable to use as flock rams, from which to breed good dense-woolled sheep.

In choosing a sire to breed stud sheep where wrinkles are in evidence, care should be taken to avoid those rams having wool with a short, gummy, hairy, very greasy tip. A ram of this type would feel comparatively dense when handled, but in reality he would not be so. Also avoid a ram with a wasty, dry, uneven fleece, or a hairy, rough, pointed tip, which is most objectionable.

One important point which farmers would do well to remember is that, no matter how careful they are in breeding, no two sheep would be exactly alike when compared with one another. There will always be a perceptible falling off amongst some of their best sheep. Such sheep should be at once eliminated from the high class stud flock, no matter how pure the blood is.

When the greater bulk of the sheep are fairly even in character, type, and condition, you may be sure that you are breeding on the right lines, but the aforementioned fact has to be remembered, that you will find a few scraggy ewes in all your flocks. See to it that they are not used again, for if left they will probably breed others as objectionable, making a mixed and not uniform flock, and lowering the high standard of the whole.

Owing to the late war and the drought, both of which occasioned heavy losses in sheep in this country, farmers had to a certain extent to keep and breed from all sorts of sheep to make up this loss, and thus heavy culling sank into oblivion, but now the increased number of sheep and the diminished demand for inferior stock should cause the breeder to cull more heavily and thus benefit the sheep industry.

When a man has obtained a good name for his stock there is a certain amount of temptation to neglect this heavy culling, and sell as many sheep as he can while his star is in the ascendant, but in selling inferior sheep he really digs the grave of his own reputation, and also retards the improvement of the sheep industry in the country.

I allow it is a great temptation to do this, but it can only spell ruination to his good name in the future and his falling into obscurity as a breeder later on. I utter this warning in the interests of the sheep industry of South Africa as a few cases have already come under my notice.

In practical sheep-breeding there are several sound principles which might be followed to the advantage of the farmer, but they are all subject to experience of individual animals. For example, perhaps from a good sire and dam we obtain a miserable specimen of a sheep; great care should then be exercised by the farmer before

using this inferior progeny on any of his flock. The farmer can only obtain a close insight as to his method of breeding and flock rearing by the results obtained and by keeping proper books with tabulated, full information in regard to the sheep he is breeding. By so doing he may come across a high-class stud ram or ewe whose individuality is more marked than others of the same flock, and when used he may be found to be a highly prepotent and valuable sire, elevating the progeny beyond himself. This improvement would guide the farmer in selecting the very best ewe possible for this individual ram, with due regard, of course, to pedigree and blood.

The breeder can therefore use with the most pronounced success and confidence, a ram of this type. I have come in contact with stud breeders in South Africa having such a highly valuable and prepotent ram; this ram would have thrown most valuable stock if well mated. But the farmer, instead of giving him his best ewes, gave him ewes which could not do him justice; therefore the progeny from this line of breeding resulted in a very ordinary-looking sheep which the breeder naturally did not think very much of. When an offer was made to purchase this sire, he immediately sold him and bought a ram at a very high figure, which, when put to better ewes, has not given the class of stock which was obtained from the animal which was sold, even with the inferior ewes supplied. It is obvious therefore that the farmer did not realize the value of the ram he owned until too late, and now I doubt if the ram will ever be heard of again or his progeny, although the owner who sold him wishes now to buy him back. The farmer should therefore keep a bright look-out for any desirable ram or ewe which shows a marked prepotency, or, in other words, has the power of stamping his type distinctly and unfailingly upon his progeny. When small deficiencies are noticed in the stud sheep, the breeder can use with success rams of extreme type to correct these deficient points; but they must have all the other good points as well or otherwise you improve one and sacrifice another. By knowing the breed of his own sheep he may fairly expect the progeny to improve from the animals he mates together. Watching the results carefully, the deficiencies should disappear, provided the breeding is within his own stud, as he will then know what to expect since from one strain of blood there would be no mixing of types or introducing of foreign blood to upset his calculations. Experiments in breeding should not be conducted on the whole flock but on a few at first to see the result. If it is negative it would probably be a financial loss besides a waste of time if tried on the whole flock. This experimenting with the whole flock has been done in the Cape Province, with the dire result that we have two or three different types of sheep in the one flock each giving a good wool but lacking uniformity; and in addition to this the breeder is in a quandary as to where and how to get different rams to suit these different types of ewes. Although these types in each individual case may be very excellent in themselves, they lack uniformity in the flock. Therefore I would advise caution in carrying out any experiments to find out the suitability of sheep to one particular district or farm. Breeders who always work with the idea of increasing the value per head of the wool on the sheep, or of the carcass, would be well advised not to expect too high a return in regard to both wool and carcass, unless the class of country warrants it by being very rich in all the necessary requirements.

A Stud Stock would not be of any real value if it did not bring about an increased commercial value to the ordinary flocks of the Province, and therefore it is the object to breed and rear up an animal from which, as far as possible, all faults have been eliminated, thus developing and increasing to the greatest extent possible that which would give it additional commercial value.

In breeding it is quite possible to form a smooth-bodied flock from a very wrinkly sheep and *vice versa*. This has been known and practised by a great many breeders in all parts of the world.

In breeding one must remember that the ram is only half the flock, and it is of no use attempting to put an expensive classic sire to the ewes and expect great results therefrom unless the ewes are worth it; then improvement will be made. There is no short cut to breeding good stock in this fashion; it requires time and judgment. It takes the same care and outlay to breed pure-bred rams or ewes when once obtained as it does a mixed or mongrel type; the same quantity of food keeps each alike, and if a mixed type will give you 50 per cent. a year, it will be from a quarter to a half of what a pure-bred flock will give you with a little more money invested at the outset in the breeding stock.

One great disadvantage of propagating the pure-bred sheep is that we sell too many inferior animals for breeding purposes because we do not like to think that we have any bad sheep in our pure flock, but, on the other hand, pure-bred inferior sheep are better than a slightly superior mixed-bred type; I think that, in the interests of the sheep industry, neither should be used. With the demand we now have for a better class of sheep and wool, we cannot afford to raise an inferior kind of sheep and expect to find a ready sale at a remunerative price.

Early maturity and easy fattening qualities are features in favour of pure types over mixed types, and as you notice those sheep which improve quickly under these conditions, they should be picked out and mated with a ram with similar qualifications.

The time is at hand when we must pay more attention to our breeding of common flocks in the general run throughout South Africa. The demand for high-class sheep is gradually growing every day, and a superior quality of wool is also demanded. As an American tritely put it to me: "We must improve our flocks or quit the business." When we say we have improved a breed, what do we mean? We mean that we have developed features that it was desirable to bring into prominence, and have submerged those which are indicative of slow maturity and profitlessness. We must not think that, because for a few generations objectionable features have been suppressed, they have been eradicated, for that is very erroneous. If we take those breeds which in their unimproved state were horned, or were breechy or hairy, we find that neglect to mate them with due care tends to bring out their horns and to cause more hair to come. If those sheep were returned to the conditions under which they existed before the hand of the breed-maker was put on them, they would fast degenerate towards the old unimproved animal with its many objectionable features. The breeder has, in fact, to wage perpetual war against this endeavour to revert. By long continued breeding on systematic lines he prevents sudden change for the worst;

in fact he finds the advantage of a lengthy pedigree, for without a long pedigree—in other words, breeding on the same lines—like does not produce like!

EARLY MATURITY.

In countries where lambs are grown for the butcher, early maturity is of very great importance, and the old method of obtaining this was to select all those sheep which showed the greatest signs of coming to maturity quickly, these being picked out and put to rams showing the same tendency, with the results that they have now certain types of sheep which are known and are recognized as breeders of this early maturity development. To a merino sheep-breeder, unless he is selling lambs for the market, it is not of very great importance.

PEDIGREE.

Pedigree plays a very important part in sheep-breeding, as blood will tell, and the longer the pedigree of pure-bred stock the greater will be the probability that the sheep will throw true and uniform. Of course, even with a long pedigree sheep may at times throw back, or a weak spot may occur which has not been noticed in the flock perhaps for generations. Pedigree really means that the blood contained in one type is thoroughly fixed, and when one buys these rams one can be certain of obtaining progeny true to type from the use of these animals. Without pedigree he gets cross-breeding, or if carried far, mongrel-breeding. Every one knows that two first crosses usually mate well and that there is fair conformity to type in the offspring. But further crossing brings about great irregularity; features long lost sight of by careful breeding crop up, and there is no uniformity. Even crossing two distinct strains of the same breed, although their pedigree may be long and their selection skilful through generations, may set up this disturbance. Who has not heard from time to time the remark: "Ever since Mr. So-and-So got that ram from Mr. So-and-So his sheep have done no good." Yet the ram might have been a high-priced one, and, mated in another strain, would have effected nothing but good, whereas it has given rise to sports under the special conditions of its mating.

CONSTITUTION.

Constitution is one of the most important points in sheep-breeding. By constitution is not necessarily meant a large framed sheep but a sheep which can fight or hustle for its living under adverse circumstances. A small sheep with well-developed front quarters can show just as much constitution as a very large sheep, and it very often shows more. This constitution can only be obtained and brought to perfection by the farmers carefully studying those sheep which seem to thrive and do best when there is very little food to be had. By selecting these sheep or good doers one is sure to obtain a good constitution, although it may not be what the farmer desires in all other respects. A few points indicating a weak constitution are the following:—

A very thin neck, straight thin pinched nostrils, flat sides, and narrow chest, and over-fine wool with no body or substance in it. In a healthy constitution the skin should be a bright rich pink colour.

ACCLIMATIZATION.

Sheep are more susceptible to climatic changes than any other animal, and it is this acclimatization which must be studied by the farmer to find out what sheep suit his district, and, when found out, to cultivate it to the highest pitch of perfection.

In some districts where the present sheep do not give the greatest monetary return it would be necessary if the farmer wished to grow any other particular breed, to see that the sheep which he wishes to experiment with have a certain number of years in which to acclimatize before he could fairly expect great improvement in the sheep. When once acclimatized it is then an easy matter to improve and build up the flock by selection. There are breeds of sheep which in one climate thrive well without any special attention, whereas in another climate, even with care, they may droop and drag out a miserable existence. In moist, wet, grassy places the merino sheep is not at home; it loves a dry, even, and arid country. The English long-wools do not love what the merino delights in; the merino loathes what the Lincoln loves. As a rough estimate I place the home of the merino where the rainfall does not exceed 25 in. a year; above that rainfall is more properly the home of the English sheep.

Generally speaking, in high altitudes the smaller type of sheep will be found to do best. The lower the altitude the heavier-bodied or larger sheep can be grown such as the Lincoln, Leicester, Cotswold, etc. It depends a great deal upon the soil and aspect of your farm as to what breed of sheep one may keep with the greatest success. An eastern aspect—i.e. facing the morning sun—is generally the most favourable. I have seen farms in Cape Colony where the paddocks, having a western aspect, grow both sheep and wool totally different and inferior in every way from those paddocks in which the sheep ran which had an eastern aspect.

SOILS.

For breeding purposes light soils are generally looked upon as the best, owing to the moisture being able to drain away after heavy rains, leaving the land dry and healthy. Clay soils are also good for sheep grazing if the water does not lie about them. Gravelly soils are healthy but not so good for young stock. Limestone soil is the best for young stock on account of the lime being plentiful, thus providing bone-making substance.

LAMBING.

From the time when the foundation is laid for the next fall of lambs to the time when these lambs are old enough to be weaned and taken away from the ewes that gave them birth, the period that elapses extends over the greater part of a year. Within this period the most anxious time for the flockmaster, as well as the busiest time for the shepherd, is that during which the ewes are passing through the lambing season. As, however, a successful lambing is largely dependent upon the care that has been bestowed upon the flock during the months immediately preceding this critical epoch, it will be useful at the outset to glance briefly at the circumstances antecedent to the arrival of the lambs.

Condition of ewes when put to the tup.—It may be accepted as a rule that animals in fair condition, but not fat, are more likely

to breed than those which are rendered lazy and indifferent by a constitution the whole energy of which seems to be expended in digestion. On the other hand, animals that are poverty-stricken and hide-bound often have the sexual instinct in abeyance or but feebly manifested, and, if impregnated by the male, suffer themselves in order to afford nourishment to the foetus with results in every way unsatisfactory. The majority of farmers will agree that "fair" condition is the best.

That some kinds of food have a marked influence upon the generative organs, exciting them to their fullest capacity short of irritability, is very largely believed, and is confirmed by careful observations continued over a series of years on different soils. That rape and mustard are the most serviceable crops for flushing ewes is also generally agreed, and they should be allowed such food before putting in the tup, a period of three or four weeks being sufficient for the purpose.

Early turnips, as well as mustard and rape, have been found very serviceable. After running the ewes over the stubbles and pastures during the day, a paddock of any one of the crops named furnishes a suitable "top up" to the day's keep. Experience proves that there is nothing so conducive to a successful tupping as separating a flock into sections of 100 or 120 ewes each, with two or three tups to each lot, and getting them on to some really good grass land; here they can remain quiet without moving or being drifted for the four weeks necessary.

Ewes must, during this month or so, be in a thriving condition—in fact, living well and leading a holiday life on some fresh ground away from their late summer pasturage.

The condition of the ram is of equal importance with that of the ewes, though too often overlooked. He, likewise, should be in the pink of condition at a time when special strain is to be put upon his constitution. We do not say that he should be "flushed or forced", as the sexual instinct is generally strong and easily excited by ewes which are ready for conception, but he could be prepared by previous food, steady feeding, and not highly artificial conditions of life. It is good practice to remove the tups from the ewes each day for a short time, when they can be provided with suitable stimulating trough-food; they will not settle to this at first, but after a few days they will be glad to come out to the troughs.

A risk is incurred in a purchased ram that has been fed for show and sale rather than service, and his diet and management being suddenly changed he is least fitted for the work immediately before him. Unless circumstances permit of purchase some considerable time before his services will be required, it should be ascertained how he has been fed, housed, and managed, and if any special spice, or so-called "food", has been given. Many of these artificial stimulants to digestion will make a sheep "blossom" as long as they are regularly given, but on changing hands and being suddenly deprived of them he may fade like a plucked flower; so that the time to make a change or to discontinue the use of such stimulants is certainly not in the tupping season.

BREEDING EWES.

Lambing takes place in Cape Province in the autumn or the spring, according to the season and the locality of the breeder. In

either case the lambing should take place when there is the greatest likelihood of the ewes and lambs having abundance of succulent green food; if the lambs at this period have not sufficient food, then no matter how good the breed is, or how large-framed the animal originally was, the offspring will be stunted and will never grow into large animals. The old adage then applies: "Half the breeding goes down the throat."

It is absolutely necessary that the ewes when in lamb should have abundance of green food so that there will be no shortage in the flow of milk.

The period of gestation in the sheep ranges from 140 to 165 days.

It has been proved that sheep as well as cows are not such good milkers in hot climates as they are in cold, the excess of heat interfering with the functions and curtailing the secretion of milk. It is better not to have the sheep's fleece too long during this period, as otherwise if the weather becomes hot and they have a full fleece, the accumulation of heat would tend to dry up the supply of milk. It will well repay to feed the animals so as to keep up a supply of milk. A great many farmers supply root crops, but these by themselves are too watery to give a rich supply of milk; I think the best results would be obtained from clovers, millets, sorghum, barley, etc. Ewes in this condition should have an ample supply of clear water, not too cold. It is not necessary to wet the foods when feeding ewes, as the wetting hinders the mastication to a certain extent. As is well known, the merino ewe is not the best of mothers, and unless she has a full and continuous flow of milk she will very often neglect and leave her lambs.

When lambs are dropped they should have a certain amount of shelter to be protected from any cold wintry winds. To this end I would advocate planting of hedges or clumps of trees to shelter the lambs when young. This will not pamper them but will give them a chance to get hardy and tough.

It is not necessary to feed the sheep on oil-cakes, bran, etc., as the ewes will do far better where there is a good supply of grass so that they can take a certain amount of exercise in the collection of their food.

In the Cape Province we seem to go to the two extremes: either the sheep has too much walking to do or else it is absolutely pampered and not allowed to take the exercise necessary for its health. The sheep is, in its natural state, a more diligent searcher after food than any other animal. When fed in barns or sheds on root crops only and without exercise, the result is cold-blooded sheep and watery constitutions. There is nothing which strengthens and enriches the system with warm blood or is so valuable to the sheep as a ramble over the pasture for its food. Rye for pasture where the country and climate are suitable is perhaps one of the most valuable crops for stimulating the secretion of milk. The crop should not be allowed to run to head but should be fed off before this time. The stock should not be allowed to run on it more than half an hour a day, its greatest value being when it is green and young, thus taking the place of natural grass when this is not obtainable, as in the winter months.

PROPORTION OF RAMS TO EWES.

It is well known that greater uniformity can be secured by the use of an individual ram which, when he has been tested and thoroughly tried, could be depended on to do an immense amount of work provided his vigour is properly looked after. I have known rams in the Cape Province which have got 250 lambs in one season.

There is a natural tendency to overwork the ram if he is a good one to the detriment of the offspring, and unless he was well watched and looked after the farmer will not get the best results obtainable.

The number of ewes put to the rams varies from 30 to 320. The number, of course, depends upon the condition the stock are in and the supply of available foods, but if one wishes to obtain the best results it is better to be on the safe side and run about one ram for fifty or sixty ewes.

It is not advisable to breed from rams when too young, although a number of breeders favour putting two-tooth rams to the flock; I think, however, it a safer plan to use nothing younger than four-tooth rams as otherwise the progeny may be affected in a deleterious manner.

Some breeders have theories of their own regarding the control of the sexes in breeding, but most breeders, we think, entertain an eminently sound aversion to any principle which professes to govern the sexual balance in the law of population. It is, however, of much interest to learn what steps have at periods been taken to endeavour to wrest from nature the secret of the balances of the sexes. It does seem curious that one cow should be blessed with a large proportion of heifer calves and another an equally large proportion of bull calves. Perhaps the theory having most adherents was that propounded by De Buzarcingues, a French savant, who flourished in 1826. He thought that if young rams were put to mature ewes and the flock kept on the richest and most abundant pastures, the result would be a preponderance of ewe lambs, whereas if aged rams were used and the flock kept on somewhat scanty pastures, yeaning time would bring a preponderance of ram lambs. He proposed his theory at a meeting of the Agricultural Society of Severac, and two members of the society consented to submit their flocks to the experiment. Flock No. 1 was served by two rams, one fifteen months old and the other two years old, the design being to breed it for ewe lambs; flock No. 2 was bred for ram lambs and was served by two rams, one four years old and the other five years old. The result was as follows:—

Flock No. 1.	*Rams.*	*Ewes.*
Two-year-old dams had lambs	14	26
Three-year-old dams had lambs	16	29
Four-year-old dams had lambs	5	21
	35	76
Five years old and over	18	8
	53	84

Flock No. 2.	*Rams.*	*Ewes.*
Two-year-old dams had lambs	7	3
Three-year-old dams had lambs	15	14
Four-year-old dams had lambs	33	14
	55	31
Five years old and over	25	24
	80	55

The results in this instance were quite favourable to the theory, whether it just happened so, and would not turn out the same way again, could only be determined by repeated trials.

Ewes should not be put to the rams directly after shearing as it tends to lessen the number of lambs. The age of the ewes should be four tooth or over; they have been known to breed till twenty-four years of age. Usually up to seven or eight years of age the best stock will be produced. In selecting ewes they should be thoroughly examined in all points, so that they can be mated with rams to help eliminate as many as possible every year of the defects noticed in the ewes. It is therefore necessary to have those points in which the ewes are defective strongly marked on the sire's side. To be able to tell the sire of each lamb so that you can see if he is improving your flock or otherwise, it would be necessary to mark him so that each lamb can be identified and placed with the parent. This is vitally necessary as it shows at a glance which rams have thrown good stock and those which have thrown inferior, with this advantage that the rams getting inferior stock can be eliminated from the flock. In dealing with the general flock during the mating season, smear raddle underneath the ram just before he enters service, and then the ewes when served, as shown by the raddle mark on the back of each, may be placed in another paddock and then marked so that the progeny can be identified as to the individual parent ram. For the different rams different colours would be necessary, say, red, blue, and green. These colours can be obtained from any firm that keeps requisites for the sheep industry. This information would then be entered in a book so that the owner would know the progeny and the effect of that ram on his flock. After gaining this information the ewes can then all be mixed up in one flock again; it only means keeping them separate for the tupping to be accomplished. This practice can so easily be carried out in South Africa where the number of ewes put to the rams very seldom exceeds more than 500 to 1500.

It is generally recognized that a female parent gives the vital organs and internal structure in a much greater proportion than the male. The constitution and endurance are derived from the male parent, as also the outward characteristics and external structure. The purer the type of the parent the greater the certainty of transmitting its quality to the offspring: that is, if the sire is of a purer descent than the ewe he will exercise more influence on the progeny than the dam, and this applies particularly when the purity is on the side of the sire. The offspring, when both the sire and the dam are of a pure descent, will be of a more uniform type with less chance of throwing back to their ancestors. Further, all diseases of the vital organs are more liable to be transmitted from the side of

the female. The whole aim of the breeder is to develop the best characteristics of a breed to ensure those characteristics becoming hereditary. It requires years of mating and culling to produce a pure type, and, unless this is observed, the result will be that the sheep will not attain any great prepotency. A good illustration of prepotency is to be found in the American Vermont Merino, which has been carefully bred for a great number of years to this end. Given a prepotent strain to one type and a man with ordinary intelligence can improve the flock by selection to almost any desired end.

IN-AND-IN BREEDING.

This has been a very vexed question with many breeders in different parts of the world for years past, and on both sides a great deal has been said. I think the consensus of opinion is that, with judicious handling and a thorough knowledge of the subject, in-and-in breeding can be carried on without any harmful results. Of course, in in-and-in breeding from a strain which is defective, these defects will be transmitted to their progeny four-fold. I do not suppose that any settlement of this vexed question will be made in our day. I have known flocks in the Cape Province that have been in-and-in bred for the last twenty-two years, and the only bad result I noticed was that the sheep were losing a little in size or carcass, but only in a few cases did I see this occur, and it might be the result of want of selection.

Where due attention has been paid to selecting healthy, well-formed sheep, the disposition will naturally in time become inherited; and it is the development of these points which is most desired, i.e. a perfect form and round constitution.

The advantages of in-breeding as applied to animals are as follows:—

Supposing that the qualities of both parents are good, in such case there will be greater likelihood of the progeny inheriting them; breeding with a view to improve the best qualities becomes centred in one animal. Should the sheep of this family not breed one with the other they would most likely have to be crossed with inferior animals of either sex; this process instead of pushing improvement would retard it. The most successful breeders by reason of this have built up and perpetuated individual families of sheep by the process of in-breeding, and the sheep from these pure-bred animals have proved the strength of heredity by the inheritance of the good qualities of their in-bred ancestors. When in-breeding fails it is generally due to neglect of proper selection and to using weak and badly-formed sheep from the flock; breeding on these lines only tends to perpetuate defects, i.e. when two animals possessing the same bad qualities are allowed to breed. In-breeding is sure to produce either an uncommonly valuable sheep or an uncommonly bad sheep. It would not do to continue too long with in-breeding if any defect were noticed on either side. Notwithstanding the good qualities of one of the sheep the tendency to breed the bad points may be too strong, and then it becomes increased four-fold and is hard to get rid of; the defects are generally handed down with greater ease than the good points introduced. Good qualities of the sheep in in-breeding are transmitted from one generation to another. They have become

part and portion of the breed and may be depended upon with the greatest degree of certainty. When in-breeding has been carried too far the following signs can be relied upon. The sheep may be able to fatten quickly, but yet they are decreasing a little in size. They may not bear the severity of the weather so well as they used to and perhaps become subject to disease. When this occurs the farmer must take it as a warning that he has been breeding too long from close affinities, so must therefore introduce different blood, but at the same time of the same family type. Now, with such a large range of sheep of the same type to choose from in different parts of the country, it would be an easy matter to choose from some flock of the same type a sheep with points resembling his own sheep as closely as possible—superior if possible and not inferior to his own sheep. He could make use of this strange ram for one season; after that he could revert to his own type and use the progeny. After a certain number of years the sheep may again require a little new blood of the same type, but the farmer could easily see for himself when the sheep are showing any tendency to fall away, and thus by using this new infusion return it to its high standard. If proper care be employed and only those animals possessing good forms and sound constitutions be allowed to breed, then beyond question the stock will be preserved pure and the proper form and qualifications will be handed down to their offspring. In-breeding is like a two-edged sword, which if used by inexperienced and careless farmers will be sure to descend on their own heads. I would not advise sheep farmers to carry out this in-breeding unless they have a natural aptitude for noticing any defects in their sheep.

ADVICE TO BEGINNERS.

The beginner should if possible always start on a small flock, as he could then gain experience slowly but surely. If he started on a very large flock in all probability he would ruin the flock and at the same time himself.

Two to three hundred ewes would be quite enough for a beginner to take in charge. Then he will gain a little practical experience whilst his flock is growing. In selecting breeding ewes attention should be given first to the udders, for if they are of a very fleshy kind they will be comparatively useless. Ewes having very thick necks rarely prove good mothers, although there are exceptions to this rule. A good mateing ewe does not carry a superabundance of fat while rearing the lamb, as all the nourishment goes to the up-keep of the milk supply. An effeminate ram should never be used in the breeding flock as a ram of this description means failure in the flock. When the ram is doing good work it is not policy to change him from the flock. Good sires are not of very common occurrence, and they should be used as long as no deteriorating effect is noticed in the progeny.

Do not run away with the idea that there are no culls in the pure-bred flocks as well as in the common flock. The best rams to suit you are not always those that have taken prizes at the shows; in fact, very often the reverse is the case. A ram with a pedigree *may* be a worthless sire, but a ram without a pedigree *cannot* be anything less. Selecting a ram is a very important matter as the

loss or profit depends very largely on this. The ram should not have the same defects in its formation that the ewe flock carries. A well-tried, aged ram is better than a young untried ram. As I pointed out before, fitting rams for the show yard by pampering generally unfits them for breeding purposes, and many a valuable animal has been ruined in the process.

Careful cultivation is necessary, as without it our domestic plants and animals cannot maintain their excellence, but will return to the primitive state in a very short while, and it requires all our efforts to keep up the improvements already gained to concert pitch. Ram lambs should receive generous feeding until they have arrived at the yearling stage. No matter what the breed of ram may be, feed well and wisely, but not too lavishly. A pampered ram is of very little use to the breeder, and even a good blood pedigree will count for very little when pampering is overdone. Young lambs require muscle-building foods, and for this purpose foods containing protein should be given them. Oats and bran are an ideal ration for rams provided they are used sparingly and for the purpose of regulating the digestive organs. In preparing ewes for the ram, flushing is adopted in many countries, and rape or the mustard plant is the best medium for this purpose.

Ewes of middle age generally give the best lambs. Defects seem to be more easily transmitted to their progeny than good qualities. Good pure-bred rams will improve a mongrel flock, but a poor bred ram will absolutely ruin a well and pure-bred flock.

In breeding it is hardly fair to expect that the dual purpose animal will possess the highest characteristics to the full extent as the animal bred for either one of these single purposes, that is, wool or mutton.

When young farmers begin to look after sheep they should go slow and grow up with their work. Nearly all our successful breeders have started and worked their way up in this manner. It is not advisable for beginners to buy show stock, but rather buy good, ordinary, pure-bred stock to start with, as all beginners will be sure to make mistakes and be discouraged, but these should only act as an incentive to fresh effort, as you will be bound to succeed in the end; but see that you purchase your rams from breeders of repute who have pure type stock for sale. Great care should be exercised in buying to see that you do not get disease with your flock. The young breeder should have singleness of purpose and the tenacity to hang on when opinions seem to give way. Do not try to breed a class of sheep which others have tried sixty and seventy years ago and failed with, but obtain good stock and improve on that by selection. The sheep should be changed from their pasturage as often as possible, and where practicable keep them by themselves and do not mix them with other stock.

In buying pure-breds, the breeder's utmost care must be given them or else he had better buy rubbish. Have an ideal to breed up to and see that no chance remarks put you off your ideal.

A small, well-managed flock is more profitable to the grower than a large one badly managed. Do not allow your sheep to be neglected by shifting for themselves, and try to aim at having uniformity throughout your flock.

Sheep Hints for Beginners.

Sheep are always improving or they are deteriorating.

When you buy a sheep for breeding be sure it is better than what you have.

The secret of successful sheep husbandry is to keep good sheep and in small flocks.

Unless there is a continued effort to improve the flocks they will go backwards instead of forward.

In purchasing a ram get one fully developed, strong in limb, straight-shaped, and thoroughly typical of his breed.

If a radical change in the rations is made too suddenly, growth of both body and fleece is liable to suffer a check.

The lamb carcass can be produced for less than the aged sheep carcass, and will sell for one-fourth more in the market.

Uniformity in wool fibre can only be accomplished by regular feeding and keeping the sheep in a healthy and thriving condition.

Wool must grow steadily and uniformly or it will have points, that is, weak places here and there that are very damaging.

THE MERINO.

There is room for all breeds; each has its place, and there are conditions which each can most efficiently meet. The place which seems best filled by some type of the merino and in which the merino returns greater profits to the general grower, is as the foundation of the average flock. The merino is the firm and true basis of nearly all general sheep-growing in this country. With a ewe flock of large, well-fleeced, hardy merinos, the farmer who keeps sheep has a workable asset from which he can realize maximum profits along whatever line he wishes to work, whether it may be to produce early lambs or mutton lambs, or to produce ewes for his neighbour. The merino has proved himself by long years of experience and trial as the hardiest, longest-lived, and best adapted to general conditions.

Black Quarter or Emphysematous Anthrax.

By J. M. CHRISTY, Assistant Principal Veterinary Surgeon, Transvaal.

IN different countries this disease is known under various names; thus Symptomatic Anthrax, Black Quarter, Quarter Ill, Black Leg, Rauschbrand, Charbon Symptomatique, and Sponsziekte have been used to designate it.

It is an acute infectious bacteridian disease manifested by hyperthermia, lameness, and a localized, hot, painful swelling on the shoulder, quarter, leg, neck, trunk, or elsewhere, tending to emphysema and gangrene, and when incised showing black extravasated blood, clotted or frothy.

For a long time the disease was confounded with anthrax proper; modern scientific investigations have differentiated the two diseases; there is now no danger of the trained man confusing them.

The disease prevails in certain limited areas in Europe, Asia, Africa, Australia, and America, and in all climates from the tropics to the antarctic and sub-arctic. It is, however, most prevalent in spring, summer, and autumn. It is especially prevalent on damp, undrained land, or such as has dried up in the heats of summer, and has become less prevalent in many localities in connection with drainage and careful cultivation.

The disease is especially common in young cattle, from three months to four years of age. Calves fed on milk are rarely attacked, being in a sense carnivorous and sometimes immunized by toxins from the dam. Cattle over four years usually escape, having already become immune if kept in an infected locality. If brought from a non-infected place they are, at any age, as susceptible as the young. Sheep and goats contract the disease only exceptionally, but like the Guinea-pig are easily infected by inoculation. Horses, asses, and white rats have only a circumscribed swelling at the seat of inoculation, and foals and buffalo calves sometimes contract it casually. Carnivora and omnivora (dog, cat, pig, bird, man) and the rabbit are virtually immune.

Causes.—The essential cause of emphysematous anthrax is a rod-shaped germ, variously known as bacillus anthracis emphysematosa, bacillus Chauvaei, Rauschbrand bacillus. This is a rod-shaped microbe, with rounded ends, found singly or connected in pairs, or very short filaments. They form spores even in the body of the affected animal, often assuming a club shape by reason of the spore formation near one end. If the spore develops in the centre they appear fusiform. They take aniline colours readily and iodine slightly, assuming in the last case a violet tint.

The microbe is possessed of great vitality. Thoroughly dried at a temperature of 95° F. it retains its virulence. The spores may be preserved indefinitely in dry soil, buildings, fodder, litter, harness, etc. Cold is equally harmless to it. It has been exposed to a temperature of 98° F. below zero without losing its virulence. Its virulence is lessened by exposure for an hour to 139° F., and it is sterilized at a temperature of 212° for twenty minutes. The dried spores are virulent after six hours of the boiling temperature, but are sterilized at 230° F. if maintained for the same length of time.

In clay soils, hard pans, waterlogged soils, and in some that are over-manured so that the atmospheric air is excluded, it may be preserved indefinitely. Feser, Gotti, and others have produced the disease by inoculating with the washings of infected marshy soils, and this is doubtless a common source of casual cases of the malady.

Accessory causes are important. The predisposing influence of lactic acid, of other organic acids, and of overwork have to be taken into account. Potash salts, alcohol, common salt, and the products of proteus vulgaris, or micrococcus prodigiosus, increase the susceptibility. Low condition, debility, or suddenly induced plethora have a similar influence. Sudden changes of weather, chills, and particularly the access of hot weather in spring, when the animal is changing its coat, lays the system open to attack. Youth, after the period of suckling, and under three years old, seems to increase the predisposition, though this is largely the result of the absence of a previous exposure to the infection, the animal, so to speak, not having grown up with the disease. Then, impermeable clay, wet, marshy soils, or those charged with organic matter, are conditions favourable to the presence of the microbe. It often appears after rains, the occurrence of freshets, and the washing out of soil infection which would otherwise remain buried. Also in the dry season when swamps, ponds, basins, deltas, river bottoms, etc., are drying out and furnishing pasture over which animals are prone to graze.

Symptoms.—Emphysematous anthrax develops suddenly, the incubation in experimental cases lasting only for a few hours, and the whole course of the disease does not usually exceed one-half to three days. The local swelling may be the first observed symptom, or there may be first febrile disturbance, followed by the local swelling. The swellings show where the connective tissue is loose and abundant, as on the shoulder, quarter, arm, thigh, neck, face, or trunk, and practically never where the areolar tissue is very spare and dense, as on the end of the tail, or ear, or on the limb below the knee or hock. They sometimes form on the palate, base of the tongue, or pharynx. The muscular system is especially liable to suffer, the looseness of the texture and the presence of lactic acid making a particularly favourable field for the propagation of the microbe. The comparative absence of muscle in the region below the metacarpus, the tail, and the ear is an important cause of this immunity in those parts.

The swelling is at first very small and tender, but it increases rapidly, and in a few hours may extend to one, two, or three feet in diameter. At first smooth, rounded, pitting on pressure, and destitute of crepitation, on handling it becomes softer and less sensitive, and when pressed or kneaded it gives a crepitant sensation and sound, or it even appears to gurgle. When percussed the resonance is drumlike. Finally, the skin may become cold, insensible, and withered like a piece of parchment. When incised the tissues are found to be gorged with blood, and of a black or dark red colour; they break down under pressure into a bloody pulp, and from the wound flows a bloody fluid, which may be red in the early stages, black in the advanced, and frothy in the latest. Where the connective tissue is very loose and abundant, the bloody extravasation is surrounded by an extensive straw-coloured oedematous infiltration. The swelling is sometimes single, but more frequently several appear and become confluent. The lymph glands in the vicinity become greatly enlarged.

Fever is a constant condition as the swelling advances, and sometimes it precedes the local engorgement. There is erection of the hair, with,

it may be, distinct shivering, recurring again and again. Then general stiffness, dullness, prostration, loss of appetite and rumination, accelerated breathing sometimes attended by a grunt or moan, and rapid pulse. The temperature usually reaches 104° F., and may rise to 109° F. The breathing becomes more and more laboured and plaintive, colicky symptoms may set in, the prostration advances to complete adynamia, the patient can no longer stand, the temperature drops to 100° F. or 98° F., and death supervenes in from eight hours to two days from the first symptom of illness.

In some cases the swelling may be invisible because it is situated deeply, or it may perhaps be entirely absent, and the constitutional symptoms are the only ones observed.

Diagnosis.—From malignant oedema, which it resembles in producing gas and crepitating tumours, emphysematous anthrax is distinguished by the greater length of the microbe, by its formation of spores at the pole and not in the centre of the bacillus, by the more sluggish motions of the germ, by the restriction of the germ to given infected districts instead of being generally distributed as in malignant oedema, by its not attacking man, rabbit, nor pigeon, which are subject to malignant oedema, by its deadly action on mature cattle, which are usually immune from malignant oedema, and by the abundant blood extravasation on the swelling.

From anthrax it is distinguished by the motility of the bacillus, by its polar sporulation and club shape, by its rounded ends, by its absence from the blood in the earlier stages, by the presence of gas and crepitation in the swellings, and by the deadly action of the infection on Guinea-pigs, but not on rabbit, man, nor pigeon. Anthrax is easily inoculable on a cutaneous sore or intravenously, whereas emphysematous anthrax is not.

Lesions.—The carcass is liable to be bloated with gas, and a reddish, frothy liquid often escapes from mouth, nose, and anus. Gas is particularly abundant in the substance of the tumour, and the skin covering it may be dry and crackling. An incision made into the swelling exposes a mass of blood extravasation and lymph exudate, the blood predominating in the centre, so that it may appear clotted and black, and mixed with gas bubbles, while the yellowish lymph forms the periphery of the tumour, yet streaked more or less with blood, or even pink throughout. The abundance of gas is usually in inverse ratio to the amount of oedema. The muscles beneath are surrounded by an exudate, and are of a dirty brown or black, and are disintegrated so as to break down readily under pressure of the finger into a blackish pulp. They are infiltrated with gas, crepitate under pressure, and assume a golden yellow colcur on exposure to the air. The gas is comparatively inodorous immediately after death, being mainly carbon dioxide and carbide of hydrogen. Later it may show distinct and even offensive odour from the formation of the hydrogen sulphide, or lactic acid. The muscular fibres are easily teased apart, and show under the microscope masses of blood globules, leucocytes, lymph cells, free nuclei, and granules, with, in some points, fatty or waxy degeneration of the fibres, or granular masses that are stained black by osmic acid. The bacillus is present in large numbers, and this, with its absence immediately after death from the blood, becomes characteristic. The lymph glands near the swelling are usually enlarged and gorged with blood. The lymph plexuses and vessels contain bubbles of gas.

The swellings may be subcutaneous, or submucous in the tongue or pharynx, but they occur also in the pleurae, lungs, heart, pericardium,

mediastimum, the peritoneum, the sublumbar, connective tissue, and even the walls of the stomach or intestine. It is not uncommon to find a pink effusion into one of the serous membranes. The liver is usually hyperaemic, as may be also the kidneys, but the spleen is rarely enlarged. In this and in the integrity of the blood globules this affection differs from anthrax.

Treatment.—This disease is so often speedily fatal, cutting off its victim in eight hours, often during the night, that no opportunity is allowed for treatment. Even in those that survive for two days the affection must always be looked on as exceedingly grave, and as little amenable to treatment. Yet much depends upon the patient and the country. Dr. Phares, in Mississippi, found that it yielded readily in many cases to ½-oz. doses of tincture of chloride of iron every four hours, and a local application composed of equal parts of tincture of iodine, aqua ammonia, and oil of turpentine. Galtier tells us that the recoveries are frequent in Algeria, while they are rare in France. Tisserant gives the French recoveries as two per cent. It is probable that in districts and countries where the malady is all but ubiquitous, the surviving animals are racially immune, or they have been largely exposed and in some degrees virtually immunized at an early age.

Wallraff mentions a success from applying a tight ligature round the infected limb, above the seat of the tumour, and freely scarifying the latter so as to freely admit the air. For swellings elsewhere, scarifications and the free application and injection of peroxide of hydrogen or potassium permanganate (2 to 3:100) would be rational treatment. The same agent might be given by the mouth, in doses of two or three ounces, at frequent intervals. Antiseptics and tonics have been freely employed, including phenol, salicylic acid, sodium salicylate, potassium iodide, quinia, alcohol, phosphorated oil, ammonia acetate, and as an eliminant, soda sulphate, but with no very good result. Locally, scarification, antiseptics, and caustics have been employed.

Another line of treatment which deserves to be further exploited is the use of antitoxins on infected animals. An immunized animal may be again and again inoculated at intervals of a week or two until it has been stimulated to produce antitoxin in large amount. Then after three weeks' interval its blood serum or blood may be sterilized by heat, the resulting coagulum washed in distilled or boiled water, and filtered, and the filtrate injected subcutem on the infected animal.

Prevention.—This is most effectually secured by sanitation of soil and buildings. Thorough drainage to secure perfect and constant aeration leads to destruction of the anaerobic germ, or the suspension of its pathogenic quality. Thorough culture contributes largely to this sanitary aeration, while baking of the surface counteracts it. When thorough drainage is impossible, it may be desirable to subject the land to gardening or to the production of crops that are to be used for human consumption, and not for domestic animals. Kitt's suggestion, to soil cattle on hay, produced on such lands, and to exclude from the infected lands all animals that by wounds or sores near the feet, or by raw gums from shedding of teeth, furnish infection atria for the poison, is sufficient, as stalled cattle occasionally suffer.

When an open porous soil maintains the infection by reason of the presence of an excess of decomposing organic matter, that may be largely remedied by a free application of quicklime. This hastens the decomposition of the organic matter, and after a year or two, when that has been largely disposed of, the good effects may be expected.

An important measure is to exclude from shows, markets, and above all from clay or other dense wet soils into which they might convey the germs, all animals brought from infected soils.

Disinfection of the buildings where diseased and infected animals have been is an essential measure. Wells and streams receiving the drainage of infected lands must be carefully avoided.

Diseased animals must be carefully isolated, and all their droppings and products of every kind disinfected.

The carcasses are best cremated, or rendered under superheated steam under pressure. Solution in sulphuric acid may be employed. If none of these are available they may be deeply buried in dry porous soil well apart from any risk of drainage into wells or water supplies. The area occupied by the graves should be fenced in, so that no cattle nor sheep can gain access to it, and any vegetation grown on the graves should be burned. The danger of the germs being raised to the surface by soil water or earth-worms must be recognized, and any consequent evil guarded against. The carcass should not be cut open, but buried in the hide, or if the latter is preserved, it should be treated with a chloride of lime solution. If a carcass is opened for scientific purposes, great care must be taken to avoid the distribution of the bacillus in soil appropriate to its preservation. The meat should not be preserved for human consumption unless it has been cooked under pressure at a temperature of 240° F. The object is not to destroy any poison which would be fatal to man, but rather to prevent the spread of the spores on new soil and the extension of the area of infection.

The reduction or prevention of sudden plethora was formerly availed of to lessen the number of victims, and it is well to still bear in mind that this has an appreciable though limited effect. As a means of reducing plethora a free bleeding was resorted to when the period of yearly prevalence approached, and no less when the disease had already appeared in a herd. I can mention an instance in which infection was carried on the fleam from the first animal bled (the sick one), and caused the fatal infected swelling around the phlebotomy wound in the next seven animals operated on. Another objection to phlebotomy is the tendency to a rapid reproduction of blood, which the depletion brings about, and the supervention of a greater danger than before, in the course of a month or more. Purgatives and diuretics are somewhat less objectionable in this sense. Careful feeding to keep the animal constantly in good condition does something to obviate sudden plethora and its attendant dangers, and thus an allowance of grain or linseed cake through winter and early spring, or when the pastures are bare, will bring the animals through in fine condition and ward off danger that comes from a sudden access of rich aliment.

Another measure was the insertion of a seton in the dewlap. The theory was to counteract plethora, but the benefit probably came rather from the formation of an actively granulating wound, which came in contact with the ground and received the bacillus, but in which the abundance of air and of active leucocytes checked the propagation of the germ and the occurrence of a fatal infection. A certain grade of immunity was the natural result in many cases.

Immunization.—As the first attack of emphysematous anthrax secures for the subject of it immunity against a second, we are furnished with a reasonable basis for the practice of artificial immunization. This has been attained by a variety of methods, the essential feature of each being the subjecting of the system of the animal to be treated to the action

of the toxins of the specific bacillus. For this purpose we supply a vaccine which can be obtained on application to the Director, Veterinary Research, P.O. Box 593, Pretoria, or through the District Government Veterinary Surgeons.

By the use of the vaccine preventive method hundreds of thousands of animals on infected lands in various parts of the world have been saved, and the mortality reduced to less than one-tenth of its former amount.

It is attended by the one danger which is not always duly appreciated, that unless its use is restricted to herds on ground that is already infected, it endangers the infection of new districts.

A great and valuable prophylactic measure should not be used in such a way as to increase the area of prevalence of the disease which is to be prevented, and also the yearly demands for more of the preventive agent. This may appeal to the business instinct, but this should ever be held subordinate to sanitary considerations. The danger might be avoided by making the State the sole distributor of such phophylactic agents, but in any case their use should be forbidden, and as far as possible prevented, upon dense and wet soils that are not yet contaminated by the bacillus. In other words, preventive vaccination should only be had recourse to on farms already infected.

DIRECTIONS FOR USING BLACK QUARTER VACCINE (Single Injection).

The vaccine is only put up in tubes containing sufficient vaccine for ten full-grown animals, the charge for which is 2s. 6d. per tube.

Apparatus necessary for operation.—

1. A small mortar and pestle.
2. A graduated hypodermic syringe with a capacity of 10 c.c. The needle of the syringe ought to be about as thick as an ordinary knitting needle, and have a proportional bore.
3. A small pointed trocar or exploring needle, which ought to be a little thicker than the needle of the syringe.

Mixing the vaccine.—Immerse the mortar and pestle for ten minutes in water near the boiling point; have at hand a quantity of water recently boiled and allowed to cool. Rinse out the syringe first with 5 per cent. carbolic solution (in water), and two or three times with boiled water.

Drain the mortar and pestle dry and then turn into the former the contents of one of the small tubes (vaccine for ten animals), fill the syringe (10 c.c.) with boiled (and now cold water). Eject a few drops of this into the mortar, and triturate the powder with the pestle so as to form a uniform paste. Continue the rubbing and gradually add the whole of the water in the syringe. When the powder has thus been uniformly mixed with the water, suck the whole back into the syringe.

The operation.—Clip the hair from the under aspect of the tail for about six inches, extending upwards from the tip. Wash this part vigorously with 5 per cent. carbolic lotion. Take the small trocar, previously purified in boiling water, and bury it under the skin on the under surface of the tail, entering it on the middle line about a handbreadth above the tip, and pushing it vertically upwards for three inches. Give the handle of the trocar a side-to-side movement so as to enlarge the gallery at its upper end, and then withdraw it. Now gently shake the syringe, insert the hypodermic needle, and inject one-tenth of the contents

of the syringe (1 c.c.). Withdraw needle and syringe together, at the same time pressing firmly on the puncture in the skin.

NOTE.—As an alternative to operating on the tail, the vaccine mixed as above may be injected under the skin in front of the shoulder. In that case the trocar is not required, but the hypodermic needle belonging to the syringe must be strong, otherwise it is apt to snap easily. The operation is more conveniently performed at this point than in the tail, but experience has shown that it involves a slightly increased risk of accident.

As a general rule suckling calves need not be inoculated, but if it has been noticed that the disease attacks such young animals it would be advisable to inoculate them with ½ c.c., and as soon as they are weaned they should be injected with a full dose.

The vaccine only protects an animal against the disease for one year, and animals should be vaccinated yearly until they are three years old.

The Mealie and its By-products—Alcohol, Sugar, Paper Pulp, Forage.

By GASTON JACQUIER, Box 5113, Johannesburg.

THE time will arrive, sooner than people think perhaps, when a glut in the mealie market will affect the prices enormously. The farmer, then, must have two strings to his bow, and, besides, it is better for a country generally if all the by-products of a plant are transformed on the spot into a more saleable substance which can replace the imported product.

The mealie can produce (1) green forage for ensilage, (2) sugar, (3) alcohol, (4) paper pulp.

The first trial was made in France of using the green mealie for making ensilage about thirty-five years ago, when a series of analyses of the mealie plant were made during the growing period in order to find out at what period the plant was richest in nutritive food.

It was proved then that it was when the cobs were in a milky form (at the stage in which the cob is now eaten in South Africa), before the cobs were ripe, that the stalks were more fibrous and contained more sugar.

After experiments made in America during a number of years, it was discovered that if the cobs were removed from the stalks in the milky stage at a certain time before the plant ceased growing it would continue to grow for a period of from four to six weeks beyond its natural lifetime, and that during this time the anatomical structure became radically changed. The plant increased in size and weight, the sugar contents also more than doubled their normal amount, while the fibre furnished a very good paper pulp.

I think it would be the duty of the Government Experimental Farm in the Transvaal to make a similar trial with the different kinds of mealies grown here.

The paper mill industry is on the eve of being started in South Africa, and it would be very important for the promoters of the new venture to know if a good paper pulp could be extracted from the locally grown mealies, because the absence of a cheap material has been up to now the drawback to the industry.

WHAT A TON OF MEALIES CAN PRODUCE IN PAPER PULP.

A ton of trimmed mealie stalks produces when milled and dried about 200 lb. of dry bleached paper pulp; a ton of leaves 300 lb. of dry fibre; a ton of green cobs and husks about 85 lb. of dry pulp, 30 lb. of gluten, and about 31 gallons of 95 per cent. alcohol.

These experiments should prove either that the farmer makes more profit in selling the plant dried for paper mill purposes and in distilling the green cobs, etc., or in producing the grain only for the market.

But the Government should assist the industry by the erection of distilleries where it would be possible to get enough of the raw produce to keep the plant working during the season.

In this country, where the farms are such a distance apart, and the roads so bad for heavy transport, the farmers should be granted a licence to distil their own by-products, as without the alcohol

industry agriculture will never progress in this country, for with cheap alcohol the farmer can work his ground, take his produce to the market, and be independent of all the cattle diseases that now make his ploughing, transport, and other farm work such an uncertain factor in his calculations.

STARCH, SUGAR, CELLULOSE, AND OTHER PRODUCTS OBTAINED FROM THE MAIZE PLANT.

Dr. A. I. Perold, Government Viticulturist (Cape), also writes on the above subject:—In the October number of the "Resumen de Agricultura" of last year there appeared an article with the above heading, which was taken over from the "Boletin de la Sociedad Agricola Mexicana". If, as I have no doubt, the substance of this article is correct and reliable, it deserves to be made known and fully discussed in this country, where the maize plant is so extensively cultivated. I propose here to give some extracts from the original Spanish article, in order that those interested in the cultivation of the maize plant might consider and carefully investigate the whole question.

The question is whether we might not more profitably manufacture the products above mentioned from the maize plant than, as at present, allow the plant to give us maize only (grain) and export the grain in the raw state. If the former should appear to be the more profitable scheme we would be supplying our own wants in highly manufactured products, most of which we have still to import from abroad.

This new industry rests on the following discovery made by Mr. W. A. Kerr and Professor Stewart. These gentlemen found that by destroying the young ears when they are being formed these, with the object of forming new ears, at once start storing up extraordinary reserves of sugar. A similar process takes place in the stalks, and no seed is formed during the period of growth.

The removal of the ear at the most favourable moment exerts such an influence on the plant that it produces more than double the quantity of sugar it otherwise produces under normal conditions.

The production of sugar from maize stalks possesses various advantages over that from the sugar-cane. Thus less difficulty is experienced in extracting the sugar. This depends on the fact that in the case of sugar-cane the internodes start ripening from below, and this gradually proceeds upwards, whereas, in case of the maize stalk, all the internodes (excepting the two highest ones) ripen simultaneously. This produces greater uniformity in the sap, and hence facilitates the extraction of the sugar.

Generally speaking, the machinery used for extracting sugar from maize stalks is pretty much the same as in the case of sugar-cane. Some alterations have only to be made for extracting the sap from the maize stalks. Whereas in sugar-cane most of the sugar is found in the internodes, we find it in the maize stalks chiefly in the nodes and immediately above and below these. This necessitates the use of a mill with a somewhat more complicated system of crushers.

Another difference in favour of the maize stalk is that four and a half months after having been sown the stalks are ready for the extraction of their sugar, whereas the sugar-beet requires six months

and the sugar-cane from twelve to eighteen months. With the proper machinery, the cost of cultivation is much less than in the case of either sugar-beet or sugar-cane.

The season (for sugar extraction) lasts about 100 days, when it is borne in mind that the stalks, when ready to be cut, can be kept for two months without losing any sugar or cellulose, provided they are not left exposed to frosts.

The value of the by-products of maize when the stalks are used for the extraction of sugar is very great.

According to Messrs. Kerr and Stewart, the cost of cultivation is about the same, whether maize is grown for grain or for sugar. The value of the stalks produced is just about double that of the maize (grain) that would have been obtained from the same area. The cost of extracting the sugar from maize stalks is about one-fourth of that required in the case of sugar-cane. As for the by-products, the pulp for the manufacture of paper and cellulose costs only half of what it costs when made from wood. The alcohol obtained from the green ears is about double that which could be produced from the dry maize (grain), and its cost of production is much less.

The value of the total products obtained is about thrice that realized in case of the sugar-cane, since in both cases the sugar produced is about the same, whereas the pulp for paper and cellulose is worth nearly as much as the sugar, and the same applies to the total alcohol produced from the green ears and from the molasses.

The following is a résumé of the advantages offered by the maize plant for the manufacture of sugar, etc.:—

1. Maize will, under proper treatment, give as high a percentage of sugar as cane-sugar does on an average.
2. It will give as much crystallizable sugar as the sugar-cane.
3. Permit area, the total production of maize stalks is equal to that of the sugar-cane in the fertile soil of Louisiana.
4. The sugar obtained is proper "cane sugar" (saccharose).
5. It gives by-products that are easily sold and realize as much as, and even more than, the sugar.
6. The cost of manufacturing this sugar is much less than in case of either sugar-beet or sugar-cane.
7. This sugar can be produced in unlimited quantities, it being possible to supply the whole demand of the United States within a few years.
8. Although the operations of manufacture are distinct, the machinery does not essentially differ from that used for cane-sugar.
9. The whole of the residue (after extraction of sap from stalks) can, at a low cost, be converted into a pulp for paper or into cellulose, which can be used for the manufacture of smokeless powder, celluloid, collodion, etc., at a lower cost than when produced from cotton.
10. The green ears are easily sold as maizena, gelatine, or even as ensilage or cattle food.
11. The combination of the manufacture of the sugar with that of the various by-products will keep the staff and the machinery of the factory busy during the whole year, instead of being at a standstill for a great part of the year.
12. The cultivation of maize for this purpose will give higher profits than if the crop were disposed of in any other way, and will therefore be to the advantage of all maize-growing countries.

The Agricultural Show Season, 1911.

IN the last issue some reference was made to the Rosebank Agricultural Show, and since then the bulk of the shows tor the rest of the country, with the exception of Pretoria and Natal, have been held. Sufficient data therefore now exists upon which to base a short review of the agricultural and pastoral conditions of the Union as reflected by these very interesting exhibitions. Beginning with the Western Districts of the Cape Province, the recognized show season in South Africa extends over a very wide period. From the end of January or the beginning of February, as a rule, the ensuing two months are very full indeed, while after this follows a slight lull to allow of Easter when the great exhibition at Johannesburg comes in, and the others, including the Province of Natal, carry these functions on into June. At first glance it would appear that too much time is devoted to shows in this country, and, as a natural consequence, too much importance attached to the minor events. As a matter of fact the agricultural and pastoral industries of this country are so varied and divergent that it would need even more shows and more time to do them all full justice.

It is only necessary to present a short résumé of the leading features of some of the larger and more representative shows to realize the full force of this argument. Starting with the Western Districts of the Cape Province, and taking Rosebank as a criterion, a set of agricultural conditions is revealed which is almost unique. The striking exhibit of fruit, for instance, with the great and growing export trade behind it is a revelation to the ordinary observer. To this must be added the full representation of the enormous viticultural industry of those districts with its more than interesting ramifications and industrial processes. In this section one sees not only agricultural produce in the shape of the magnificent exhibits of fresh grapes of dozens of different varieties, but with it are included the manufacturing processes which give this country its excellent wines, and the sound potable spirits which are now becoming popular with all sections of the community. It has always to be remembered that viticulture is one of our few agricultural industries—sugar and tea being the others—which carries with it all the manufacturing processes that go to the completion of the finished article. It is also one of the very few industries this country possesses which allows of anything approaching closer settlement. Should any one doubt this statement let them take a tour through the wine districts of the west and see for themselves the large and growing population engaged continuously in the various stages of industrial occupation which go towards the production of good wine. Economically and industrially the fruit and vine industry of the west is a great asset and one that in time should be a source of great wealth. It is only a question of time when the country will be filling up with population, and this industry must advance.

Although the larger pastoral industries are catered for at Rosebank, they are not usually over well patronized. The wool, mohair, and ostrich feather sections can generally be passed over as of not too great importance, but the Merino sheep and Angora goats shown

here of late years have been of a very high class. The remarkable feature of these classes is that, though the wool industry in particular of the south-western districts is of very great importance, it invariably happens that the bulk of the exhibitors of woolled sheep at this show are from the eastern districts or the Karroo. This year was no exception, so that we find this one very important section in no sense representative of the industry as it exists in the immediate vicinity of the venue of the show. It is a pity that the sheepmen of the south-west cannot be induced to exhibit, if only in special classes, for they produce some of the best wool in the country. In Persian and heavy breeds for slaughter the immediate district is always fully represented, and this would indicate that there is a future for this type of sheep as the markets become better organized.

Cattle and horses are always the great feature at Rosebank, for both these industries are very strong in the west. But even allowing for this more can be seen of the industrial side of these sections at shows like Robertson or Worcester than is invariably the case at Rosebank. Anyhow here we have three important industries which may be seen to perfection: first the fruit, next the viticultural, and thirdly, dairying, for the exhibit of dairy stock at Rosebank is always of the best.

When we pass to the Eastern and Midland Districts of the Cape, which usually follow the western in the series of shows, we at once enter upon a set of conditions which are very different, and from these dates onwards the predominant note is stock, with the addition of the ostrich feather. The Border shows, like Kingwilliamstown, Queenstown, and Aliwal North, are largely devoted to Merino sheep, cattle, and horses, and very fine stock they show in these parts. The Midland and south-east coastal belt introduces us to the mohair industry, in addition to the wool, and here we usually get the ostrich as well in all the pride of place. Cattle and horses are also features, but they seldom assume the comparative importance they take at a show like Rosebank. Centres like Middelburg (Cape), Cradock, and even Grahamstown and Port Elizabeth in a modified degree, have grown to be the battle-ground almost entirely of the sheep men (Merino), mohair men (Angora), and ostrich breeders and feather growers. The other features never seem to take the same rank to the farmers. Of course the visitors are attracted by the "entertainment" side in which the horses take a large share, but the industrial side of these shows largely consists of the sections mentioned above; the others seem to be of less significance. In the east and the midlands, too, the produce takes on a different aspect. Whereas in the west these classes mostly consist of wheats, oats, rye, and barley—and these not too strongly represented although they form the staple industries of those districts—in the east and midlands we get into a region of maize and lucerne, these being the main crops. But even these do not take up nearly so much attention as one would expect, the principal interest being stock, wool, mohair, and feathers.

In the northern sections of the Union, again, one seems to get to a more regularized set of farming conditions. The Free State, from the agricultural standpoint, as seen, say, through the Bloemfontein Show, is advancing very rapidly on exceedingly sound lines. Woolled sheep and dairying, with pigs for by-products, would seem to be the main ultimate aim of the farmers there, and very sound

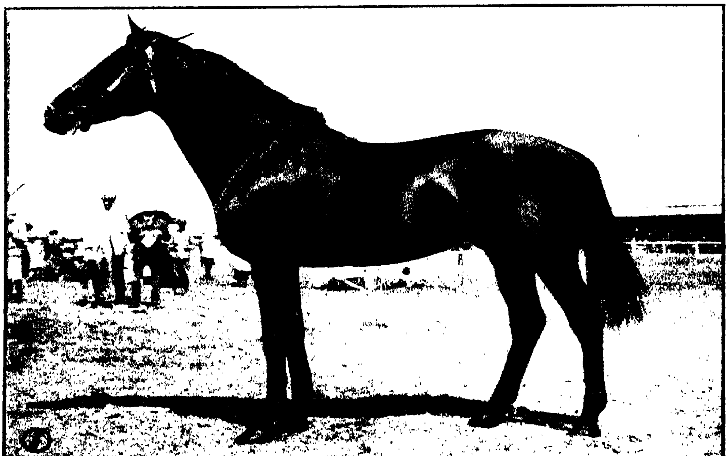
Agricultural Show Season, 1911.

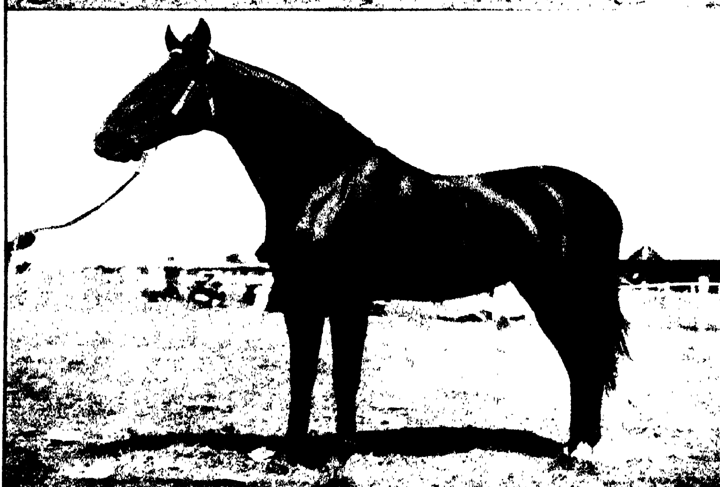
Among the Power Pumps at Port Elizabeth.

30 h.p. Ruston-Proctor Suction Gas Plant pumping water at Port Elizabeth.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.

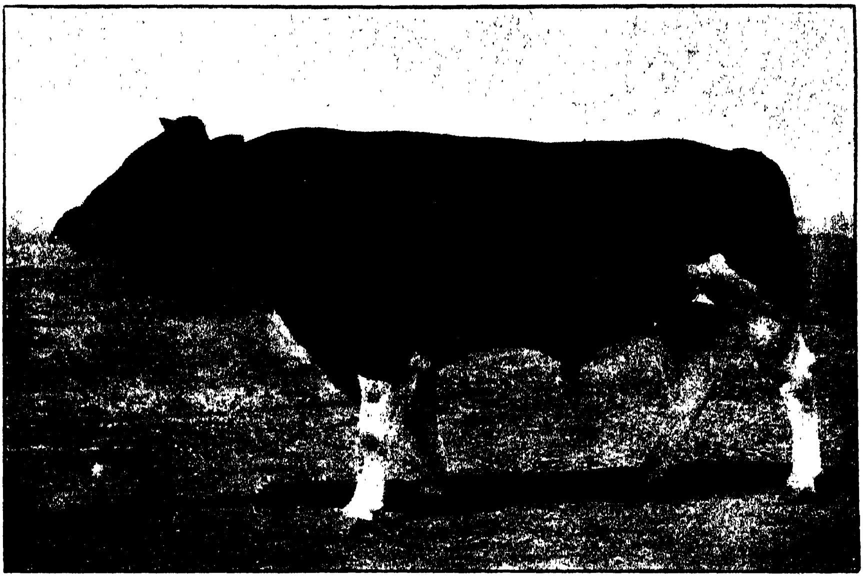




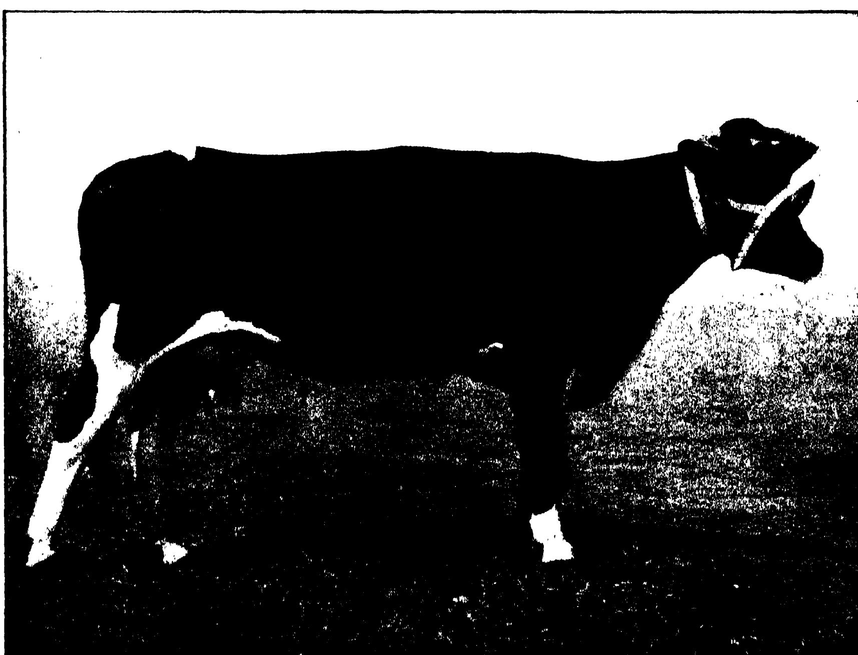
1. "Ravilious", Thoroughbred Stallion, the property of De Beers Consolidated Mines. First at Port Elizabeth.
2. "Sean Chuidhe", Thoroughbred Stallion, the property of De Beers Consolidated Mines. Shown at Port Elizabeth.
3. "Lord Ossington", Hackney Stallion, the property of Mr. R. Morton. First and Hackney Champion at Port Elizabeth and first at Bloemfontein.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.



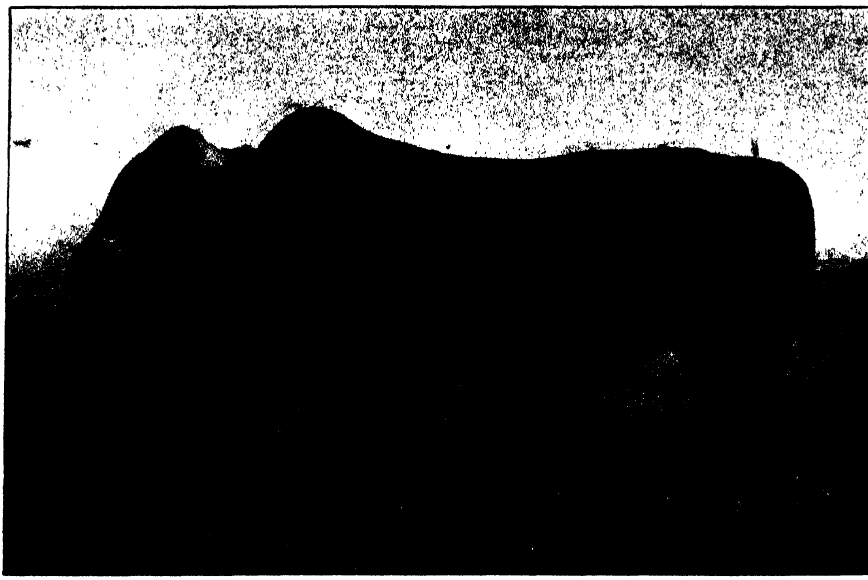
Champion Friesland Bull, Bloemfontein (imported). The property of Mr. D. C. Gradwell, Merino Farm, Bloemfontein.



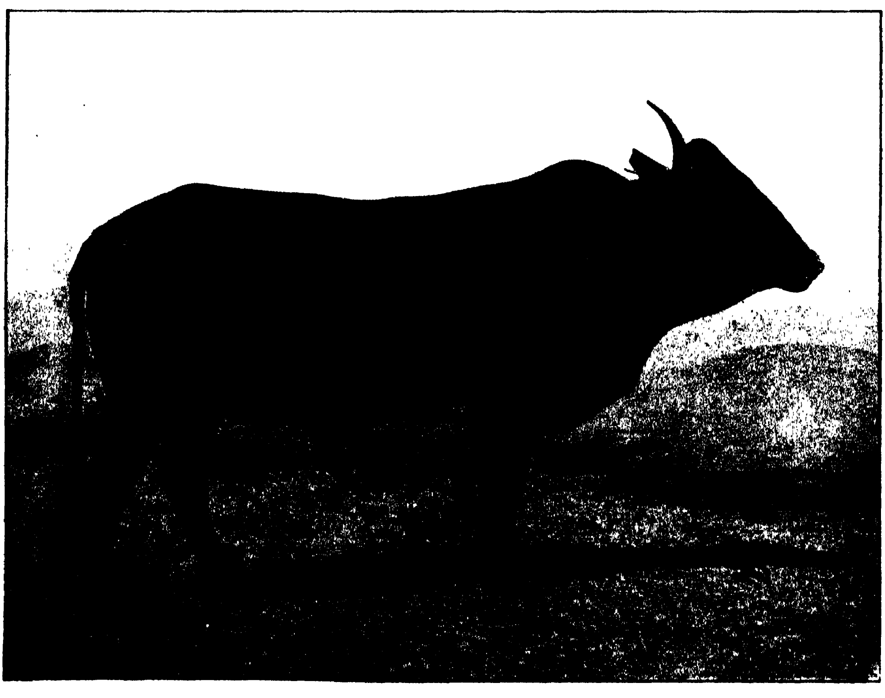
Champion Friesland Cow, Bloemfontein (imported). The property of Mr. D. C. Gradwel Merino Farm, Bloemfontein. As a two-year-old this cow gave 10,374 lb. milk in 250 days.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.



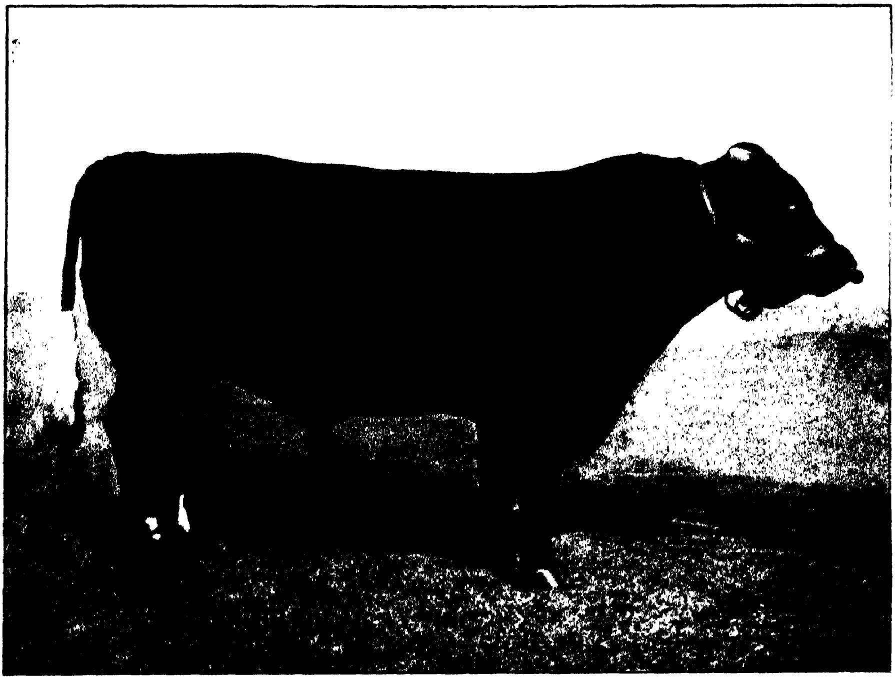
Champion Afrikander Bull, Bloemfontein. The property of Mr. B. J. Gradwell, Bloemfontein.



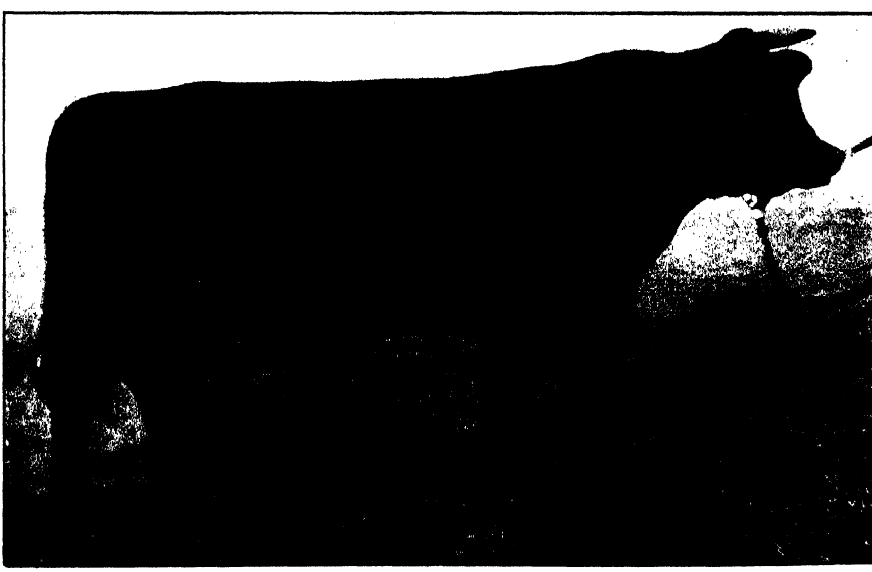
Champion Afrikander Cow, Bloemfontein. The property of Mr. B. J. Gradwell, Bloemfontein.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.



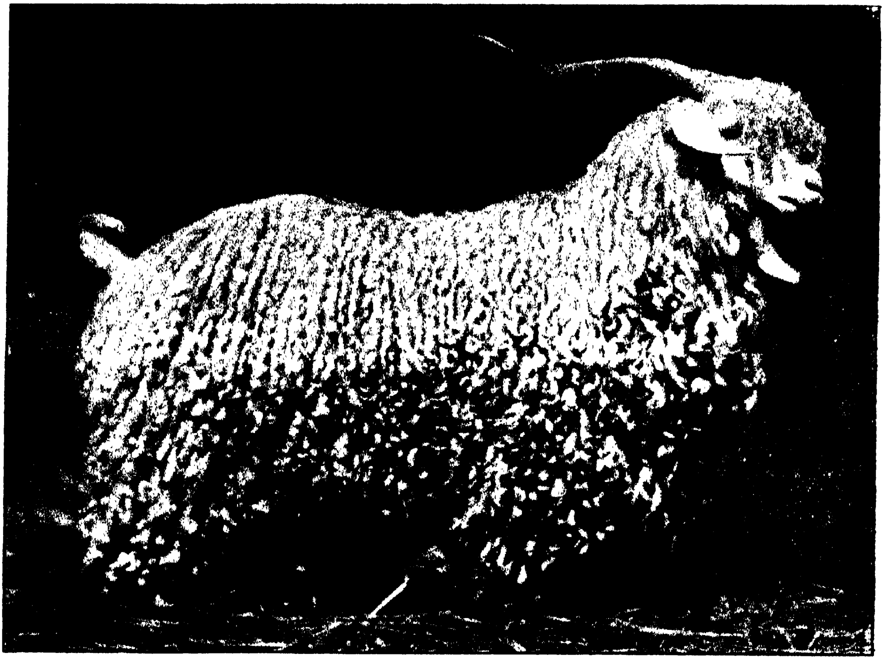
Champion Shorthorn Bull Port Elizabeth. "Masquerader", the property of Messrs. Geo. King and Sons, Bedford C.P.



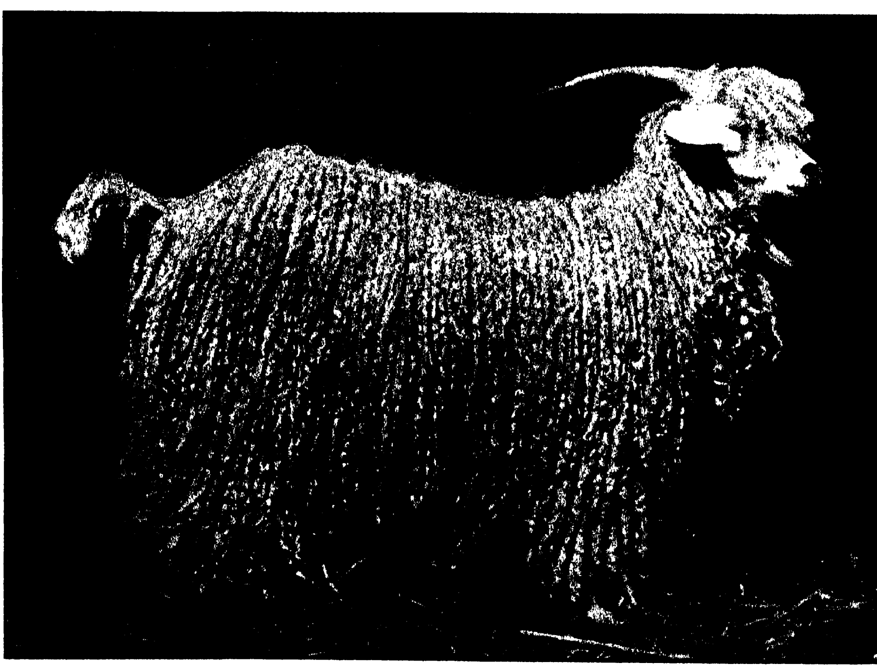
Imported Red Lincoln Shorthorn Bull, champion at Grahamstown. The property of Mr. H. C. Painter of Kroomie, Fort Beaufort, C.P.

Agricultural Show Season, 1911.

Some Champions and Prize-winners.



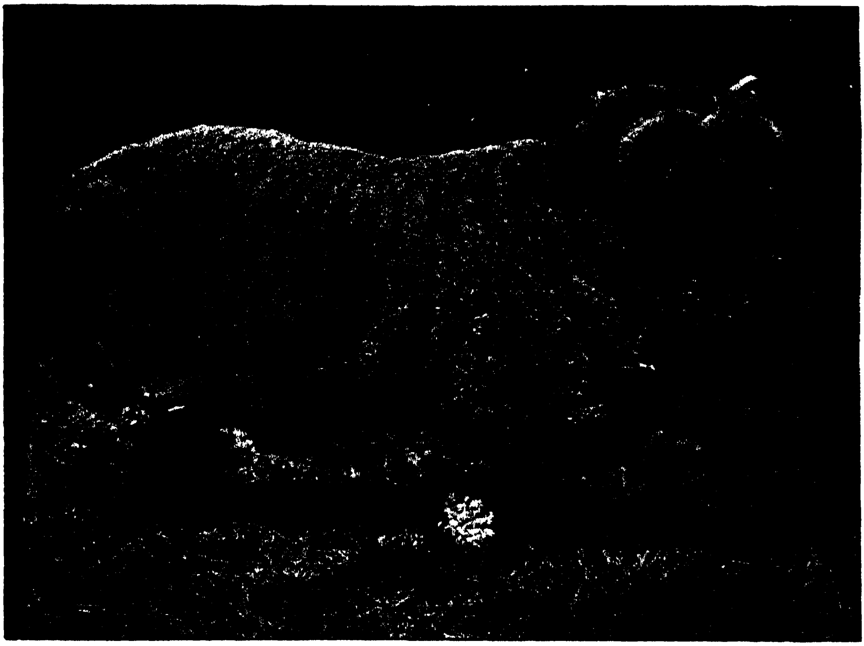
Champion Angora Ram, Port Elizabeth. The property
Full mouth.



Angora Ram, the property of Messrs. Cawood Bros Winner of the Mosenthal Cup at Port Elizabeth. Two-tooth.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.



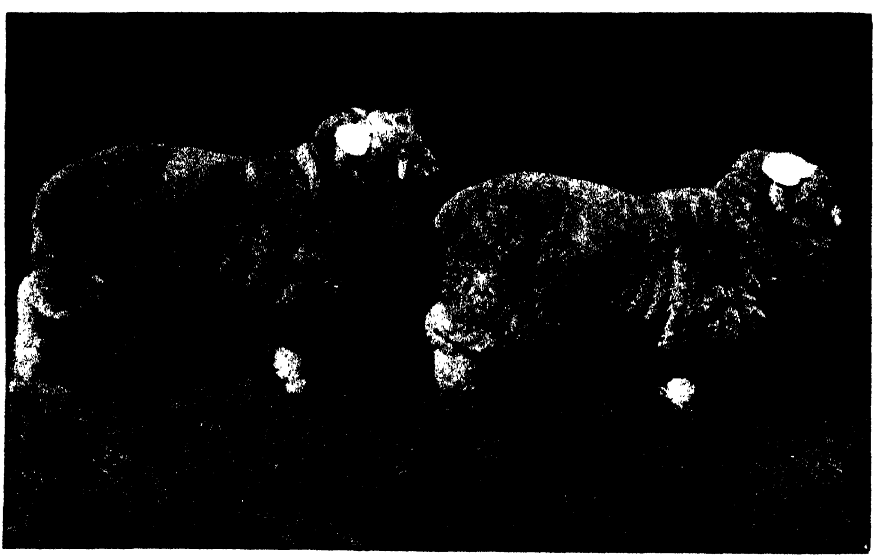
Mr. J. H. King's (Tarkastad, C.P.) Robust Woolled Merino Ram. Champion of section and champion of yard, Johannesburg.

Messrs. Edwards Bros.' (Schoombie, C.P.) Robust Woolled Merino Ram (imported). Champion in his section at Port Elizabeth and champion of the yard at Bloemfontein. This ram was placed third in his class at Johannesburg.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.

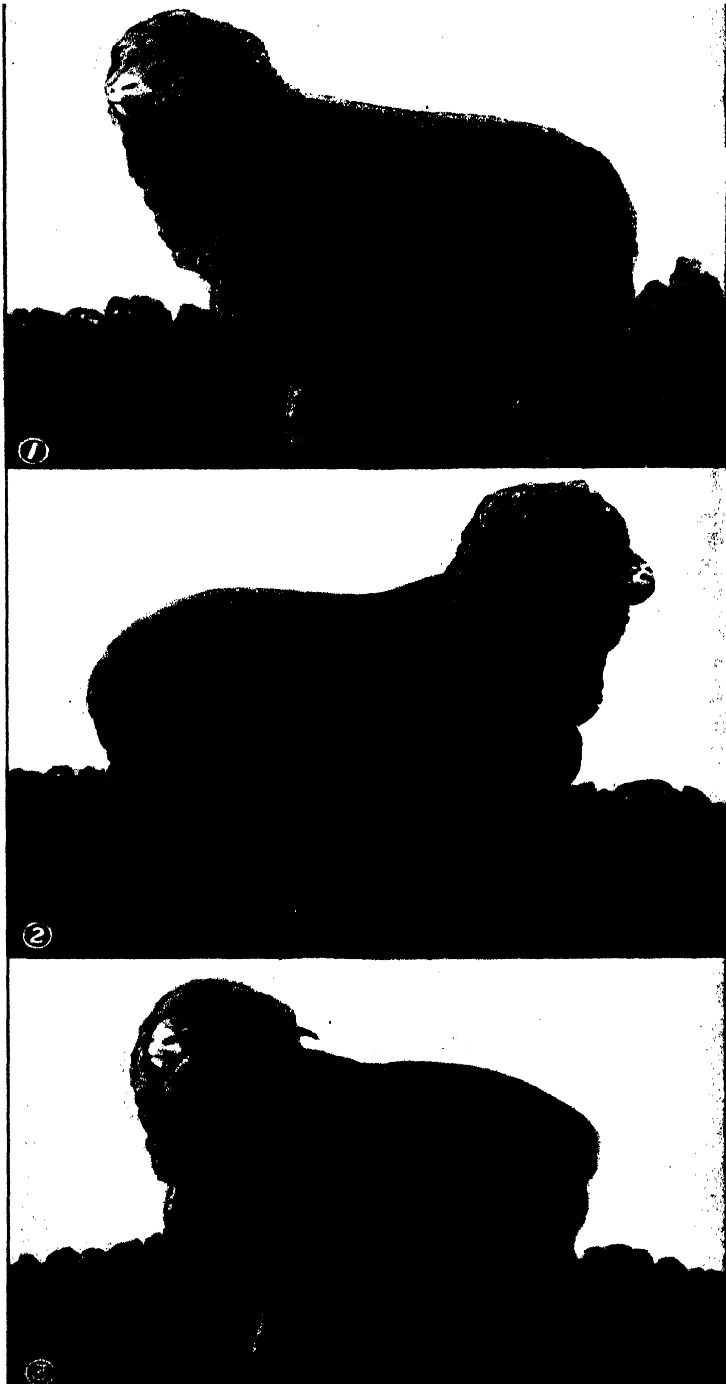
Messrs. A. & V. Robertson's (Maquabie, Amersfoort, Transvaal) two-tooth Fine Woolled Merino Ram. Champion of section, Johannesburg, and two other first prizes.



Two other rams belonging to Messrs. A. & V. Robertson which, grouped with the one above, secured first prizes at Johannesburg.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.



1. Robust Woolled Champion Ewe, Port Elizabeth. The property of Messrs. Edwards Bros. Schoombie, C.P.
2. Champion Fine Woolled Merino Ewe, South African bred, at Port Elizabeth. The property of Mr. J. H. King of Tarkastad, C.P.
3. "Loadstone", Champion Fine Woolled South African Bred Merino Ram. The property of Mr. J. H. King of Tarkastad, C.P.

Agricultural Show Season, 1911.

SOME CHAMPIONS AND PRIZE-WINNERS.

Champion Fine Woolled Ram, Bloemfontein. The property of Mr. F. W. Southey, Steynsburg, C.P.

First Prize at Port Elizabeth for Merino Ram registered in South African Stud Book. The property of Mr. Francis Bayly, Deelfontein, C.P.

they are. The maize industry has taken a great hold of the people, stimulated by the opening of the oversea markets, but it is impossible to conceive the continuance of an export trade once these enterprising men can secure sufficient of the right class of stock to consume their crops in this country. The cattle section at the Bloemfontein show was the finest ever seen in South Africa. For variety of breeds, for quality, and for actual numbers it has never been excelled, and even compares more than favourably with the magnificent cattle section at Johannesburg. The difference between the two sections was that while at Bloemfontein the animals shown were fully representative of the actual industries of the country reduced to an industrial basis—not one Government exhibit being on the show—the cattle section at Johannesburg was partly made up of exhibits of fine Government stock from experiment farms and animals imported by rich men largely for the purpose of show. It is not at all necessary to decry Johannesburg in order to praise Bloemfontein—they each stand on different planes—but when it comes to comparisons on sound lines of real industrial activity the latter undoubtedly has first place in this section at least. The value to the whole country of the magnificent animals exhibited at Johannesburg may not be quite realized for the moment, but they will make themselves felt in the very near future, for their progeny when distributed over the country must make an enormous difference to our herds. Therefore every praise is due to those who are spending their money in the introduction of thoroughbred stock even though they may for the moment outclass the breeders of the country. The Government exhibits are, of course, for the general good of the community and serve a great educational and industrial purpose, but a show made up of such units cannot, in any sense, be so representative of the industrial progress of the country as one like that at Bloemfontein made up entirely of the results of individual enterprise. In other words the one is entirely a farmers' show, the other is not.

Comparisons are again inevitable between these two shows in the section devoted to woolled sheep. They were both so excellent and such thoroughly representative animals were exhibited that they might almost be taken as one class. In each the leading features were the remarkable predominance of leading Cape breeders and the number of the winning animals who were old friends seen at either Rosebank or Port Elizabeth. This would seem to indicate that our sheep lines are rather narrow. But as in the case of the south-western sheepmen, noted previously in connection with Rosebank, so it would seem to be with the Free State and Transvaal flockmasters: there appears to be some diffidence in coming into competition as yet. There was one honourable and praiseworthy exception at Johannesburg in the person of Mr. A. G. Robertson, who entered the lists on behalf of the Transvaal against all comers and scored high honours with his rams. This should encourage others to come forward, for it is no earthly use leaving this kind of thing to one section of the community. Just as the stud-breeders of the different sections of the Cape Province have developed the sheep which suit their local conditions, so it will be the duty of those engaged in similar work in other parts of the Union to follow this excellent example. The one point they must keep before them is to be sure

they have the right foundation, that is, do as the Messrs. Robertson are doing, get the best they can and build on that to meet the local conditions.

With the exception of wool, mohair, and ostrich feathers, at a few of the shows the tendency does not seem very decided in the direction of very keen competition in general farm produce. Here and there, notably in high-class vegetables at Rosebank, general farm products at Grahamstown, and a few other pleasing exceptions, the crop exhibits are poor. Take the Western Province Agricultural Society's Show at Rosebank. This is in the midst of the greatest grain producing districts of the Union. Yet the exhibits of grain in competition were very few. At Port Elizabeth, one of the centres of the most important wool and mohair industry, the same story can be told of these classes. At Grahamstown, Middelburg (Cape), and Port Elizabeth the display of ostrich feathers was beyond criticism, and it seems a pity that this spirit of emulation is not more widely shown in other products. The Free State and Transvaal farmers seem more inclined to compete in general produce sections, but even here there is plenty of room for improvement.

While the net result of the Show Season, so far, may be described as fairly satisfactory in many respects and quite encouraging when viewed broadly, those who are interested in the advance of our staple agricultural industries may well insist that more is still needed before we can lay claim to that credit which should be earned. Comparing one show with another will not carry us to this goal. What is wanted is a wholesome spirit of emulation and a full recognition of the really valuable work which the Agricultural Societies are doing for the country, and a whole-hearted spirit of co-operation between the competitors and the executive officers. So much depends upon the mere "attractions" to be found at the larger shows now that it is not easy to offer any comments upon this phase of these functions. The "gate" depends to a great extent upon attracting a big crowd, and as a big crowd means big money, it is difficult to cavil at this feature. But even allowing for this it seems necessary to offer a word of warning against the tendency to introduce more and more of these "attractions". The danger is that the mere "attraction" side of the programme may develop at the expense of the utilitarian and educational. This kind of thing has happened before and will happen again unless it is controlled. No one wants our agricultural shows to descend to the level of a "fair", as has been the case in other parts of the world. If they do, a demand will be put forward for some other form of "show" which will give the farmers the opportunity they need of seeing what is best and comparing it with what they have.

One of the outstanding features of the season of 1911 has been the displacement of a type of ostrich feather which has swept all before it for nearly ten years. For about that period Mr. Oscar Evans, the noted ostrich breeder of the Bedford District (Cape), has been exhibiting his famous double floss feathers and has always been placed at the top. This year he has had to give way to others, the judges at both Grahamstown and Port Elizabeth giving first place to other types which have been developed comparatively recently. This in itself should show the great progress which this industry is now making in the hands of the careful and skilled breeders who

have taken it in hand, for the Evans feather cannot be said to have deteriorated. It is the others who have improved. With such evidence before us it is easier to understand the confidence of the ostrich farmers and their desire to protect the high-class birds they have developed in order to keep the industry, at any rate the best of that industry, within the four corners of the Union.

A peculiar feature of the season has been the reversal of judgments from place to place. Attention has been called to several which have occurred in various parts of the country. The most notable case is that of a very fine Merino ram (imported) the property of Messrs. Edwards Bros., of Schoombie (Cape). This animal was placed as champion in the robust woolled section at Port Elizabeth. At Bloemfontein he was placed in the same position and also given the grand championship of the yard. At Johannesburg he was placed third in his class, and of course had no chance for the championship.

Other cases are quoted in which wool was treated in much the same manner. The most remarkable of these is that quoted by the Cathcart paper, which says: "At the Cathcart Show Mr. Warren secured first, Mr. Harty second, Mr. Kemp third, and Mr. Arnold what would be equivalent to a fourth. At Port Elizabeth Mr. Arnold got first, Mr. Harty second, and Mr. Warren third. At the Bloemfontein Show Mr. Kemp got first and Mr. Arnold second. In the cup competition at Kingwilliamstown and Port Elizabeth Mr. Arnold gained first against Messrs. Harty and Warren." It is certainly very difficult to account for these contradictory decisions unless one is to suppose that all these wools were so very even as to puzzle the judges in each case how to place them. That, however, seems scarcely possible.

Swiss Milch Goats in South Africa.

QUITE recently a number of correspondents have asked for information with reference to Swiss Milch Goats and their prospects in South Africa. As a certain amount of experience has been gained in this country in connection with this subject, and as a good deal has been placed on record, we feel that it would be as well to reproduce the information available for the benefit of those who may be interested.

There have been several importations of Swiss goats to this country at various times, but, unfortunately, very few records have been kept of their subsequent careers. Many have been lost in the course of time, their progeny having been indiscriminately crossed with the common goats of the country until there is little or nothing left to indicate what the original strain may have been. But we have some records of a few, and those we have tend to show most encouraging results.

THE TOGGENBURG VARIETY.

In the year 1902, for instance, the *Cape Agricultural Journal* contained a short reference to a small herd of Toggenburg goats quite recently imported by a Mr. Konschel, of Uitenhage, from Switzerland. The Toggenburg variety stands right in the front rank of the Swiss milking tribes, a position which they share with another deep-milking variety known as the Saanen or Appenzell tribe. In England the Toggenburgs have made a great name for themselves as milkers, for, according to a lecture delivered by the President of the British Goat Society, one of these animals yielded a fraction less than a gallon, or about five and a half bottles, of milk per diem. The Cape Agricultural Department then urged the importance of developing this breed for this country, but very little seems to have been done in that direction, and, so far as our present information carries us, even the small flock then imported has been allowed to die out.

Bryan Hook, in his well-known work, "Milch Goats and their Management", considers the Toggenburg the most valuable of the Swiss tribes. According to all authorities, it is easily acclimatized and thrives as well in the stable as on the hills. They are not beautiful to look upon, being rather lean and bony-looking when in profit, but like all good milking strains of cattle seem to throw all their strength into the production of milk. They have a remarkable power of transmitting their characteristics to their offspring, many half-bred animals showing all the distinguishing characteristics of their race. These Swiss goats have been specially bred for milking for many years past, and the people of the canton in which they are reared are most particular as to the care with which the young are selected. It is only the very best milkers which have been preserved, the others being promptly converted into mutton. They are a peculiar shade of brown with white streaks fairly evenly distributed. The majority are hornless, only about one per cent. of the males being thus armed. The coat is usually shaggy and rough.

The goats imported by Mr. Konschel of this variety gave an excellent milk return. Three out of four ewes that kidded gave four

to five bottles of milk per diem for about four months after kidding. Unfortunately, of the six ewes imported in kid, two died shortly after arrival; the others dropped two kids each.

THE SAANEN OR APPENZELL VARIETY.

The next record we come across in this country is in 1906, when a Mr. C. R. Gardner writes from Johannesburg to the *Cape Agricultural Journal* calling attention to some goats imported from Switzerland by Mr. Walter Rubidge, of Dalham, Graaff-Reinet. He had heard of them through a Mr. Read, of Johannesburg, who had been fortunate enough to secure some of this strain which were then giving excellent milk returns. This particular lot of Mr. Read's were secured by a Mr. Bowker, manager of Mr. Henry Steytler's estate at Lawley Station. It would be interesting to know what has become of the progeny of these animals, as at that time the ewe was giving five bottles of milk per diem and it was found necessary to milk her three times a day.

This shipment of animals turned out to be of the Saanen or Appenzell variety, and Mr. Rubidge afterwards gave full particulars to the *Cape Agricultural Journal* for publication. According to the details then supplied, Mr. Rubidge imported these goats about 1903, the original shipment consisting of seventeen animals—two rams and fifteen ewes. Of these he parted with nine to friends, keeping seven ewes and one ram for himself, and in August, 1906, his flock comprised thirty animals, notwithstanding that he had sold about a dozen. Those who took the rest of the shipment did not, however, do so well, for at that time they were represented by about nine animals.

When Mr. Rubidge purchased these animals in Switzerland the ewes generally were guaranteed to yield five bottles per day, and one exceptional ewe was guaranteed to give ten but she never gave more than eight. The change of climate, too, made little or no difference, the animals having maintained their condition from the time they were landed. Mr. Rubidge, in giving further particulars, stated that they cost him about £12 per head to land them on his farm, and he had sold the rams bred by himself at £10 each. Their prepotency was very marked, the progeny from crosses showing the parentage at once. They were great milkers, and he believed there was a great future for them in this country, particularly for people with small holdings. But to make them a success it would be necessary to handle them with the greatest of care, otherwise they are such prolific milkers that they waste themselves to death. If left to themselves, they will give milk up to the day they kid, and people with only one are sorely tempted to allow them to do this. The result is that the ewe becomes so worn out and exhausted that she dies in kidding. The worst is that the offspring usually die as well. The ewes should be dried off at least six weeks to two months prior to kidding.

Shortly after this a Mr. E. Wolff, of Vosburg, near Britstown, in the Cape Province, also wrote to the *Cape Agricultural Journal* stating that Messrs. Battenhausen Bros., of Britstown, had imported some Swiss goats some few years before, and he had been offered a five months' old ram at £5. These ewes, he stated, gave six bottles of good milk daily. He procured some cross-bred ewes and

rams from these by using Boer goat ewes, and these looked exactly like the Swiss parent, the only difference being the addition of short horns. These half-bred ewes gave, after kidding, an average of four and a quarter, three and three-quarters, and three and a quarter bottles of milk daily. They were tested while running on ordinary veld, but if stall fed it was believed they would give much more.

Later on, Mr. Rubidge gave some details of the progress of these animals. He said that, in April, 1904, a Swiss ewe kid was born. In July, 1905, she gave birth to a ewe kid, and in February, 1906, she gave birth to twin ewe kids. In November of the same year these ewe kids, being only eight months old, gave birth to three kids, one single and one bearing twins. On 6th February, 1907, the mother gave birth to twin ewe kids, making a total of ten from the one dam before she was three years old. From July, 1905, to March, 1907, she had not been out of milk for a single day, and then had more milk than her twin kids could consume.

THE COSTS OF IMPORTATION.

In the year 1906 the Cape Government set inquiries afoot, through the Agent-General in London, as to the probable cost of importation. It was then found that the freight rates on goats from Hamburg or Antwerp, the nearest probable ports of shipment, would be £5 per head on shipments from one to five animals, six and over £4. 10s. per head, with a further reduction of 5s. per head on shipments of twenty and over. What the rates may be now we cannot say. The steamer provided boxes or pens, and food and water. The price of good specimens of the Saanen breed, it was ascertained, was, in Switzerland, about £3 to £4 per head. The lowest freight from Berne, in Switzerland, to Hamburg, per rail in truck loads of from twenty-five to thirty animals, was £17. 8s., with additional expenses such as attendant, fodder, litter, Customs dues, charges, etc., the whole working out to nearly £1 per head. So that Mr. Rubidge's figures could not be considered excessive when to these estimates are added the costs of landing in this country and transport to Graaff-Reinet.

That there should be some future for these animals in this country is undoubted, and they should be of some value in tiding over the interim period in those sections afflicted with East Coast fever, for, we are credibly informed, the problem of a fresh milk supply is becoming acute in some of these centres. It would be of great value just now if some of those gentlemen who have interested themselves in this matter in times past would again publish further details of their later experiences.

Treatment of Gardens.

WITH SPECIAL REFERENCE TO THE HIGH VELD.

Paper read before the E.R.P.M. Horticultural Society. By A. E. BESTER, Acting Government Horticulturist.

EXPOSURES.

THE question of exposures in small gardens generally resolves itself into a question of, what shall we plant on the sunny side of the house for winter and what on the shady side? As the planting, more particularly of flowers for winter brightening of our gardens, has to take place when the whole garden is bathed in sunshine most of the day, it is well to bear in mind that the immediate south side of the house is not a good place to try to raise a winter garden. North and east sides and, of course, any portion of the garden on which the shadow of the house does not fall (or any other building or trees) is equally good for raising winter-blooming stuff, such as violets, pansies, violas, Damaraland daisies, narcissi, in all their various families or divisions.

Now with regard to exposure for vegetables, I would just go to the opposite as far as possible. Of course one naturally does not plant those immediately under one's front door (if the house faces south), but what I advocate every time is to plant your winter vegetables, such as Savoy cabbage, lettuce, cauliflower, kale, etc., where the first rays of the sun cannot strike them. After the temperature has risen and thawed the frost out of them, say, by 10 o'clock, or even earlier, the fact of the sun bearing directly on them will have no damaging effect. On the other hand, if the sun comes into direct contact with them whilst they are still frozen hard, the effect is practically the same as if you held a magnifying glass between the vegetable and the sun.

For summer blooms of all sorts, the beds which have shade during some portion of the day as a rule will do best. It does not appear to be of great moment whether the bed is shaded in the morning or the afternoon—the difference in growth is very small. The bed or beds which obtain some slight shade during the hottest part of the day, say from 12 to 3, undoubtedly do the best of all; that is, of course, provided they are treated in a similar manner to the rest so far as manure and cultivation is concerned. Certain plants, however, will thrive where others fail—petunias, salvias, salpiglossis, penstemons, and such like will thrive in the most exposed positions. In the case, however, of the salvias and penstemons it is advisable before the hottest weather starts to mulch the bed right over with an inch or so of fine stable litter. These two plants are largely surface feeders, and by keeping the surface cool they are able to extend their feeding operations.

SOIL.

If the soil is variable and other considerations allow, put your vegetables in the heavy soil, your dahlias and cannas on that or the nearest approach to it, and your flowers on the lighter soil. Very little of your soil, if my memory serves me right, can be classed as heavy. It is mostly of a light, sandy nature, although some of it

contains a certain amount of clay. It needs, so far as I can judge, a fair supply of well-rotted stable manure or cow manure. Deep digging in the first place and through working in the second, with the addition of the above-mentioned manure, should make it almost ideal for gardening. If the soil is very sandy the more cow manure worked in the better, and the addition of clay, if obtainable, would materially assist the gardener.

Watering should not be necessary more than once a week to any particular bed (except perhaps just the first week or so after planting). Cultivation must, however, take place as soon as the surface is dry enough. In the case of beds, however, in which either through the position in the garden or some other reason such as shallowness of soil or sharp slope, no amount of water appears to be able to do more than just keep the plants alive, I would strongly advise at the start, immediately after planting and the first watering, that a good deep mulch (2 to 3 inches) of stable manure be placed all over the bed. The effect of this is sometimes marvellous.

In discussing the question of utility versus ornament so far as the small garden is concerned, this appears to me to be largely a matter of the occupier's weekly wage and the size of his family. If the bill for vegetables is making serious inroads into his wages, then I say by all means let him devote the whole of his garden to vegetable raising. He will get just as much outdoor—or shall I say surface—exercise as he would in raising flowers. There is always the actual house itself which he can do his best to beautify with creepers, and probably a small veranda on which he can indulge his love for flowers. To those with large gardens or longer purses I would say plant a portion of your garden with vegetables and fruit trees. The vegetables I would, however, only try to have in the scarce time. There are but few gardens here on which vegetables could be grown sufficient to carry over from year to year, and added to that it must be borne in mind that the ground on which cabbages, potatoes, and in fact all vegetables grow, wants a rest. No vegetable should be planted on the same ground two years in succession. For instance, if cabbage is planted in one spot one year, turnips, peas, or beans should be planted in that spot the next. The best way, if you intend to raise for all seasons, is to divide the plot into three—one plot for summer and one for winter, whilst one plot is recuperating. By this means you will avoid the necessity of planting too soon on the same plot. During the time this is recuperating I would advise you to work in the manure and dig the ground over, turning in all the weeds as soon as they come up. It is an old axiom that two ploughings are equal to a dose of manure, and the same applies to digging. The fertility of the soil is largely increased by this fallowing and digging.

ORNAMENTATION.

When we come to this point it really embraces most of what I have to say, with the exception of a word or two for fruit trees, and they would only be applicable to the larger gardens; and undoubtedly a good deal of what I am about to say regarding ornamentation—by which I mean flowers and lawns, shrubs, etc.—can only apply to the larger houses.

The first point to be considered in this matter is general appearance. Now, all will admit that a well-kept lawn, with beds

of bright flowers and a few specimen shrubs, is a sight which most of us would walk a mile to see; but there is also another consideration, and that is for those who are fortunate enough to possess a vehicle, be it motor or horse drawn. In their case, in laying out the garden, I would endeavour to have my road pass as near to the front door as possible, and to bear in mind that a sweeping curve adds almost as much to the general appearance of a place as a large expanse of lawn. Possibly to make this curve it necessitates the lawn being cut in two or considerably reduced in size, and possibly also leaves a piece of ground next to the gate which would otherwise have been lawn, which appears too large to make into a simple bed and too small to make into a lawn with beds cut out in it. Let me remind you that broad grass verges or edgings look almost as well as a lawn, and the balance can be filled with flowering shrubs with possibly a border of herbaceous plants. I mean by all this that if it came to a question of a lawn with a straight road by the side on the one hand, and a garden with a good sweeping curve to the road—that road bordered on either side with good wide grass verges—on the other hand, I would choose the latter every time. This question also to a certain extent applies to the whole of the gardens, only in some cases it is path instead of road. How often one sees a narrow border each side of the front door anything from a foot to two feet wide, the edge lined with bricks or stones; creepers are planted, and perhaps for a year or so bright flowers fill that narrow border. After that the general complaint is that none will grow well. Of course they will not, because the creepers, being stronger rooted, starve the smaller plants. It is not much good putting on manure except for the creepers. They will get it all anyway. Now if, instead of that narrow border, a good sweeping curve had been made which would make the beds in front of the house more or less half a circle or, at any rate, segments of a circle, those beds would continue to grow flowers for years, because there would be room for the roots both of the creepers and the other plants as well.

Whilst on the subject of creepers, it should be remembered that heavy creepers, such as honeysuckle, ought to be planted not only where one needs the shade in summer but also where one needs protection from the winds of winter. If the house and veranda face south, I would not plant an evergreen, such as honeysuckle, but some deciduous plants, such as roses and wistaria or bignonia. These would give shade in summer, and, being leafless in winter, would not keep out the acceptable warmth of the sun during that period. In any other position it really resolves itself into a question of taste. A bare brick wall facing south will carry ivy or ampelopsis. The latter will also do on an east wall. Roses and wistaria in practically all exposures.

Hedges in all gardens, whether large or small, are best made of cupressus, and although *Cupressus macrocarpa* does well in some places, it has the unfortunate failing of a plant here and there suddenly dying. For this reason I prefer *Cupressus Lusitanica* or *Cupressus Arizonica*. Either of these do well, and although the colour is not so pleasing to the eye, the hedge, as a hedge, is generally more satisfactory. Privet also is a good hedge plant, but that most in use in this country is semi-deciduous, and unless the so-called Chinese variety is used I should not advise planting privet.

In the edgings used for small gardens, perhaps the best of all to use in the violet. It makes a green border all the year, yet if the runners are kept off it yields bloom for the best part of five months. It repays all the trouble one expends on it. No soil seems to come amiss to it. But—and this is a "but" I must impress on all—don't try to raise white violets in the garden with others. If you do, and are not very careful, your whole garden will either be smothered with white or washed-out-looking blue ones. The reason for this is that the white is dominant over the blue, or that it bears seed much more freely than the blue, and those seeds have much greater vitality.

BORDERS.

Now with regard to these, it must necessarily be largely a question of the size of the garden. To those with very small gardens borders of mixed plants are most out of the question, and to those I would say, if you are going to do anything in even a small way, don't try to mix your plants. Don't try and grow a penstemon a foot or so away from a dahlia or canna. If you have a border next to your dividing fence, make that a row of some good, bold flower—dahlias, cannas, chrysanthemums. Any one of these will make you a good show, but remember they are all pretty rank feeders, and if you want good results you must give them food. To those with larger gardens I would say, make your border with good variation, dot it here and there with a flowering shrub, but keep these towards the back. I do not say right at the back. Neither in the planting of your phlox, penstemon, tuberose, aquilegias, helianthus, Shasta daisies, galliardias, do I care to see rows of each, although the general effect should be a sloping down from back to front, yet the effect to be graceful needs to have the plants to a certain extent mixed. In the largest gardens where beds have been cut out or formed with edgings I would plant some, at any rate, with an entire plant such as carnations, salvias, pansies (all one colour), with possibly a few tuberoses in amongst them.

Massing of colour is only suitable for large gardens.

SHRUBS.

The shrubs which will be found to thrive best would be the varieties of the cupressus, the Callitris, Cedrus Deodara, Cryptomeria, Laurels, Craegus, Lelandi. Whilst almost all of the deciduous flowering shrubs do well, perhaps the best are the Cydonias, Cuelder Rose, Hybiscus, Syricus, Pride of India, Spirea (Cape May), Mock Orange, Weigelia. Laburnum is not a success as a rule; I would not advise any one to plant this. I would advise all to plant one or two of the purple-leaved plum (*Prunus Pissardi*), and, if room enough, some of the double-flowering peaches.

FLOWERS.

The range of these is more or less limited only by the size of the garden. I have already mentioned a good many which do well, and would add Nicotiana Affinis, sweet peas, mignonette (partial shade), delphinium, both annual and perennial, foxgloves, antirrhinum, linium, Canterbury bells, stocks, coreopsis, Barberton daisies.

ROSES.

It is somewhat difficult to give a list of these which would apply to all sizes of gardens. Any good catalogue will give you the idea of the habit and colour. Perhaps the best roses, or I should say those

which thrive best, would be:—Francisca Kruger, Gruss aus Teplitz, La France, Maman Cochet, Florence Pemberton, Frau Karl Druschke, Lady Battersea, Carolina Testout, Alice Graham, Madam Leconte, Rainbow, Alphonse Karr, Beryl, Mildred Grant, Soeur de C. Guillot, Frau G. von Boch, Archimede, Killarney, Marie van Houtte, Peace, S. de Pierre Notting, Jules Finger, Ernest Metz, K. Augusta Victoria, Lady Roberts, Perle des Jardins, Pssde Sagan, Son de President Carnot, Lady Waterlow, Liberty, Empress A. of Russia.

Now the treatment of roses needs far more space to deal properly with it than I have at hand. Sufficient to say then, feed them well. Prune them hard, and thin your blooms if you want good specimens. In pruning, cut away all the small weak wood and reduce to three or four eyes of the last year's growth. In feeding, mulch in the spring and dig in the autumn; add some bone meal when you dig. In thinning the bloom, thin early, as soon as they are large enough. Don't let your roses stand in a pool of water one day and the week after suffer for want of it. That way comes mildew. Dust sulphur on them occasionally or spray with ammoniacal copper carbonate.

POT PLANTS FOR VERANDAS.

The treatment of the various plants differs so much that one cannot lay down any definite rules. Ferns and palms need plenty of water, but must not be allowed to become water-logged. Spray them overhead in the heat of the day. Begonias—fibrous-rooted and tuberous—need plenty of water also, and care must be taken when the plants are in full growth that they get enough at a time. Frequently a plant is watered, but because the space at the top of the pot has been filled with soil, or nearly so, the pot will not hold sufficient water for the needs of the plant. In that case it should be filled up two or three times until it is thoroughly soaked, or taken and stood in a bucket for twenty minutes. When tuberous begonias commence to ripen off withhold the water, not all at once, but give the plant a little less each time. As soon as the top of the plant drops off remove the tuber from the pot and place in perfectly dry sand until the following spring, when they should be started again by placing in a box with a little soil and manure in the bottom, and only a little sprinkled in between the tubers. As soon as growth has started they may be potted up, but care must be taken to keep them rather on the dry side, as at that stage they are very liable to rot off.

The yellow and white arum lilies should be treated much the same, except that they should not be removed from the pot, but the pot turned on its side. When these are ready for potting again they should be shaken out and put into a larger size pot each year. The plants are fond of rich soil, and if large blooms are desired they must be fed accordingly.

In the planting of fruit trees in the garden this should be done in July. Ground well trenched over 18 inches deep, and if hard under that, the spot on which the tree is to be planted should be broken another 18 inches—top soil returned to bottom, and bottom soil to top. Plant the tree as near same depth as it has stood in the nursery. All damaged roots should be cut back; tramp tree in firmly. Cut back hard when you plant—if a one-year, to about 20 inches, and only allow three to four branches to form. Select these branches with a view to the balancing of the tree, and be careful that they are spaced at least 2½ inches apart.

White Ants (Termites) in Natal.

By CLAUDE FULLER, Government Entomologist (Natal).

THE damage done by White Ants (*Termites*) in Natal is, and always has been, very general, quite a number of species being involved. Except for Haviland's observations, which were not extensive, no studies have been made of them, and they present a wide field of scientific research well worthy of a special investigation on account of the economic results which are likely to accrue therefrom. Whilst many soils abound with White Ants others are, comparatively or quite, free from them, but this feature of their bionomics has not been properly investigated. The depredations of these insects are common to field crops, orchards, gardens, tree plantations, and to houses.

A peculiar form called the "Rice Ant" is found in certain districts, which destroys standing crops. This species does its destructive work in the open, and not in dark galleries as obtains with all the others, of which one often destroys the maize stalks left standing as winter feed for cattle. Certain orchard trees are very subject to attack in infested lands, particularly plums, pears, and apples. The peach enjoys complete immunity, and citrus trees are only attacked under exceptional circumstances. When heavy scrub and underlying débris is cleared off and the land immediately planted to trees, the starving Termites have been noticed to attack trees and plants which ordinarily they have no liking for.

Most trees are destroyed by the eating away of the roots, others are often greatly injured by arboreal habits induced by the suitability of the bark layers to Termite nourishment, but no truly arboreal forms such as those met with in Australia and South America occur. Many garden plants succumb to them, chiefly roses. This frequently follows the application of stable manure, of which the insects are very fond. Wooden houses are always liable to attack unless constructed of timbers which the ants do not favour, such as some of our local hardwoods and those of Australia. The woodwork of stone and brick buildings is frequently destroyed, either because no provision has been made to prevent the Termites gaining access thereto, or because of some ridiculous fault in the design adopted to prevent their inroads.

Arsenic, arsenical solutions, and carbon bisulphide have proved the most useful agents we have for White Ant destruction. But from a fairly lengthy experience in giving advice to inquirers, and in making practical application of my own advice, I have found so much depending upon the conditions of attack that a study of these upon the spot is necessary before attempting any treatment. More particularly is this the case where the infestation extends to the woodwork of brick or stone buildings.

I have noticed that it is a common practice with most people to endeavour to destroy the nests in the immediate vicinity of the site by digging out, the queen being sought and destroyed. A "boncella" of a shilling or so is usually offered per queen to the native workmen, and the rest is left to Providence. In many cases this treatment is ineffective, because certain species undoubtedly possess small supplementary queens. These are overlooked, and about them the myriads of workers, which the

mere digging out of the nest fails to destroy, are bound to gather. Moreover, even where thoroughly done this work is never extended far enough afield to secure immunity from attack. I have seen houses badly infested within three or four months after building-operations finished, in the neighbourhood of which the nests were supposedly destroyed.

In breaking up lands for orchards, gardens, and tree plantations, the mounds are broken up and the land ploughed over. To the mound-building forms this causes little inconvenience, and to the chimney-makers none at all. The latter are always easily dealt with, but as the mound-makers rarely make fresh mounds, all traces of their habitations are immediately lost and their treatment rendered almost futile.

To give a case in point. A large wattle plantation, which has since been extended to several thousand acres, for three or four years showed an annual loss of five per cent. of the trees from Termite attack, and the dwellings of these insects could not be discovered; but, by destroying the nests in the virgin land before ploughing the damage from White Ants has been reduced to a negligible quantity in the newer parts of the plantation.

In preparing land for orchards or tree plantations it is most essential to search for and destroy all the nests upon and about the selected area, and upon and for some considerable distance around the sites selected for buildings.

This can be done with carbon bisulphide. If a natural downward gallery or air funnel exists in the nest the liquid can be applied through this, care of course being taken to plug up the opening immediately afterwards with soft clay. Where no natural pipe exists a hole should be made for 18 inches to 24 inches downwards with a crowbar, and the chemical poured therein—preferably pouring four or more fluid ounces through a funnel to prevent splashing and waste.

There is, however, no better treatment than that of pumping hot arsenic fumes throughout the nest. Where no natural gallery occurs the nest should be carefully cut into (sliced with a spade) until a well-defined gallery is found. This should be about three-quarters of an inch or more in diameter, as pumping into smaller galleries is seldom very effective owing to the rapidity with which they become choked. There is a machine upon the market known as the "Universal Ant Destroyer", which consists of a pump connected with a fire-box—on the principle of the blacksmith's bellows and forge. A charcoal (or dung) fire is ignited in the fire-box, the powder to be heated is placed upon the live coals, and the lid closed. The fumes escape under pressure through a flexible iron hose, the end of which is inserted into the Termite gallery. The proprietors of the machine supply a patent powder with it, but equally good results are achieved at much less cost with a mixture of powdered white arsenic (75 per cent.) and flowers of sulphur (25 per cent.).

After pumping into a nest for a few minutes the white fumes will be seen issuing from unexpected and unseen openings in the soil; these should not be closed immediately (except where the fumes are issuing in too large a volume), so that as much air as possible may be driven out of the nest and the fumes generally distributed. After a little while, however, it is best to close them, so that the fumes may be deposited thoroughly throughout the nest.

The effect of the hot fumes is to kill the insects they come into contact with; but, further than this, the poison being deposited in a fairly even layer upon all the surfaces of the galleries and in the fungous

beds, the nursery of the young, those insects escaping death by contact and heat succumb subsequently to the poison. Moreover, the nest is rendered uninhabitable for some considerable period.

Wherever it can be and is thoroughly applied there is no better treatment than this, and it is the one that has been applied with so much success in connection with wattle-growing.

As a matter of observation I find that damage is usually the result of the proximity of a well-established and old colony of Termites, although, of course, new nests are frequently equally guilty—as in the case of one discovered under the hearthstone in a house. It is not possible to say to what distances Termites will drive their galleries, although some nests have been found penetrating downwards ten feet and more. In the original experiments in connection with Termite attack on wattles, the greatest distance I have found the fumes emerging from an opening into which they were being driven was over fifty feet; there is little doubt, however, that the galleries are carried much further afield.

New nests are constantly being established even if the rate of survival of pairs emerging from a nest is only one per million. These new nests have been frequently found in undisturbed grass-lands. They are also frequently established in interstices of buildings, especially where there is a certain amount of moisture and food readily accessible to the first-born brood.

Bluestone appears to act as a deterrent to White Ants, but its use in this connection has not yet been fully inquired into. Termites destroy many garden plants upon the coast of the Colony, especially roses. A number of people make a practice of watering their roses once a week with a dilute solution of copper sulphate (about 1 lb. to 60 gallons of water), and they assure me that plants regularly treated are never attacked.

Field Trial Section at Cradock Agricultural Show.

SLUICE GATES FOR FARMERS.

THIS exhibition came off on the 14th of March. There were two classes, viz., the one for "Sluices and Sluice Gates for Field Use", in which a £20 prize was offered; and the other for main furrow and canal head sluices and sluice gates, which were for exhibition only. There were forty exhibits in all. Mr. L. J. Roberts won the £20 prize, and at once most generously made a present of it to the society towards next year's field trials.

The judges' report is as follows:—

The judges are unanimous in awarding the prize to Mr. Roberts for his exhibit of an iron gate (adjustable for various flows of water), working in a reinforced concrete sluice extending well into the banks on both sides and also into the bottom of the furrow, thus making it impossible for water to wash round or under the contrivance. Water-

THE PRIZE-WINNING SLUICE, EXHIBITED BY MR. LLEWELLYN J. ROBERTS.

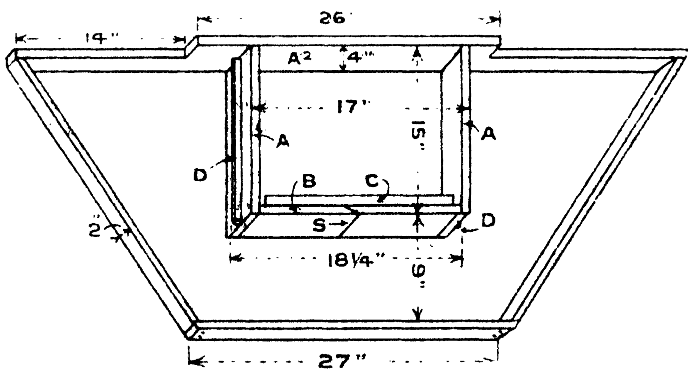


Fig. 1. Projection of "Form" or Mould.

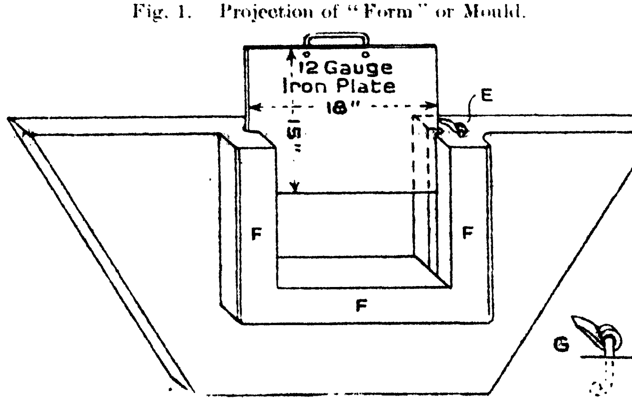


Fig. 2. Reinforced Concrete Sluice.

way 16 inches broad. Cost price of material, 3s.; makers' selling price at Fort Beaufort, 5s. Its simplicity, durability, and cheapness will recommend it to most farmers.

Messrs. Holden & Co., Ltd., Port Elizabeth, have a fine show of thirteen exhibits, among them the "Evans" sluice of galvanized iron

pipe (from 18 to 24 gauge), fitted with sluice gate of same material. An excellent idea, a simple arrangement easily removed and replaced. Specially adapted to beds.

Mr. John Hartman, Conway, exhibits a galvanized iron (20 gauge) sluice and sluice gate which runs well into banks and deep into furrow. Novel, clever, easily regulated, a very useful appliance. Semi-circular in form and 17 inches in diameter Price, 11s. at Cradock.

Mr. R. A. Hockly exhibits a very strong black sheet iron (¼ inch thick) sluice and sluice gate extending well into banks and furrow bottom. Of excellent design, very durable, and bound to work well, but too expensive for general use. Price, 37s. 6d. at Fort Beaufort. Water-way 18 inches broad.

Of Messrs. Rayner & Roberts' three exhibits, all with solid hard-wood frames, two have very simple and ingenious devices for regulating the flow. One of these gates also has a unique device for making a water-tight joint with the sluice and for preventing sticking. These two gates are applicable to all field sluices. We consider the sluice frames have not sufficient area in contact with banks to prevent water washing round.

Messrs. Philip Bros. exhibit a strong reinforced concrete sluice with wood gate. Price of material, 3s.; mould, 30s. in Port Elizabeth. It is deficient in protection from water washing round. With splayed or semi-circular wings to form sluice to banks we consider this would be an excellent sluice. Water-way 18 inches wide.

Mr. R. Richards, P.O. Selbourne, exhibits a concrete sluice with vertical pillars and wooden gate. Price of material at Addo, 3s. 6d.; mould, 15s. 6d. Water-way 2 feet broad. This requires splayed wings to pillars to make water-tight joints with banks.

Mr. McIntyre exhibits a very substantially made concrete sluice in four slabs about 2 feet square each. Recessed to fit one another exactly and with groove carrying black iron gate. Price of materials and gate for water, 1 foot square, 5s. 6d. at Fort Beaufort.

Mr. B. K. Mayo, of Bayville, exhibits an excellent example of splayed wing, sluice pillars of vitrified brick, easily made water-tight to banks, and grooved in front to take sluice gate of wood.

Messrs. Whyte & Scrimgeour, among other exhibits, show a sluice and sluice gate of the usual corrugated galvanized roofing iron stiffened with black bar iron. Water-way 1 feet 10 inches. Price, 8s. 6d. in Port Elizabeth.

In the class " for exhibition only ", Messrs. Mangold Bros. show some really well-made sluices and sluice gates for main furrows and canal heads. For low water pressures the gates are raised by chains attached to a horizontal cranked axle, riveted with pinion and spur wheel. Size, 4 feet 3 inches by 3 feet 6 inches. Price, £8. 18s. 6d. in Port Elizabeth. For greater depths of water they show gates raised and forced down by the usual screw shaft and hand wheel. Breadth, 5 feet; height, 2 feet 6 inches. Price, on pedestal complete, £12. 10s. Both classes of gates working in frames of angle iron having wall attachments fixed to them.

We consider this section an excellent display, reflecting great credit on the exhibitors generally and also the honorary secretary, Mr. Geo. H. Byrnes, who has worked it up.

(Signed) E. T. GILFILLAN,
S. MONTAGUE GADD,
O. E. G. EVANS,
P. J. J. COETZEE, Judges.

Black Wattle and Australian Willow.

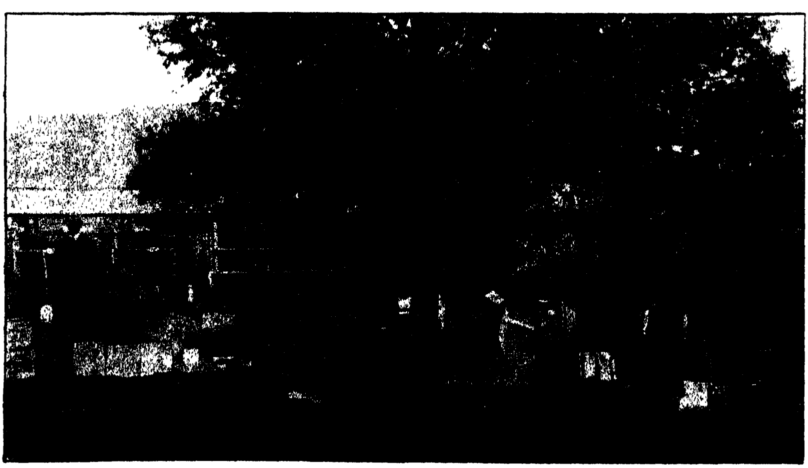
Foliage of *Acacia melanoxylon*. I. The compound pinnate leaf of a young tree. II. The *phyllodium* or flattened leaf-stalk form of foliage which predominates in old trees. 2 to 10 show, serially, different stages of this phenomenon of leaf-abortion (reduced).

The Green Rose. *Photo by A. E. Kelly.*
Showing the remarkable leaf form of the petals.

Agricultural Show Season, 1911.

WHAT A KAROO FARM CAN PRODUCE.

Remarkable exhibit at Cradock of the products of one Karoo farm, shown by Mr. J. F. Venter, of Beetjeskraal, in that district. (See article.)



General View of Competing Sluices and Sluice Gates in Field Trial Section at Cradock Agricultural Show. (See article.)

What a Karroo Farm can Produce.

AT the Cradock Agricultural Show this year an excellent exhibit was shown by Mr. J. F. Venter, of Beitjeskraal, in the Cradock District. Being "The best collection of products raised on any single farm in the Midlands", Mr. Venter's exhibit was an eye-opener to most people who visited the show; some 225 articles being shown by him which reflects great credit on the exhibitor. The exhibit came under the special notice of the judge for this section, who, in commenting on it, said it was very pleasing. The exhibit showed not only flowers, grasses, produce, jams, and preserves, but solid goods, woods, mealies, flour, meat, bricks, samples of gates made of ten sorts of wood, fences, game, skins and hides in raw and manufactured state, feathers, honey, and no end of good things where the skill of Mrs. Venter came to the help of her energetic husband. The exhibit as it stood was an education in itself, and the number and quality were all that could be wished. The following is a list of the articles shown. It is well to notice that the samples of produce shown were under competition in various classes and were also prize winners:—

Lucerne hay (sweated); ditto (unsweated); peas; roses; dahlias; carnations; chrysanthemums; marguerites; stocks; violets; bottle-brush; geraniums; mignonette; marigolds; pansies; annuals; sweet williams; another flower; creepers; fuchsias; prickly pear syrup; mulberry syrup; peach, tomato, orange, apricot, mulberry, and plum jam; canned pears, plums, tomatoes, apricots, apples, and peaches; dried pears, figs, peaches, and quinces; bread; 3 kinds of biscuits, 3 kinds of cake, and 3 kinds of butter; quince jelly, tarts, soap, and ham; 3 kinds of milk; fowls; eggs; lamb and mutton; fats (2 sorts); koeremoer; candles (fat); honey (comb and bottled); wax, bees; cells of wax; water; crystallized fruit, water melon, and figs; raisins; mattress and pillows; grapes (canned); 3 kinds of ostrich feathers; ox fat; horns; dusters; sole leather; ox hide; reims; strops; rhebok skin; sausage stuffer; sheep fat; wool; goat fat; mohair; kid's hair; bastard sheep skin; fat tail; Boer buck fat; goat's skin (prepared); goose feathers; duck feathers; steinbok skin; gate of 10 sorts of wood; ladder of 5 sorts of wood; wire fencing (7 kinds); mest for fuel; bark of mimosa; manure; yokeskey; yoke; potash; white clay; bricks; dassie buchu; wilde als; aloe, ditto syrup, ditto jam, ditto pills, ditto for feeding; wild cotton (tree), ditto leaf; prickly pear, ditto cut; besom bush; bark of mimosa trees; bark of gum trees; quagga tea; game: 3 kinds of hares, partridges, and plover; 10 kinds of grasses; 15 kinds of bushes; pears; peaches; apples; grapes; figs; mulberries; quinces; prickly pears; oranges; walnuts; almonds; pomegranates; naartjes; lemons; carrots; cabbages; mealies; pumpkins; squashes; vegetable marrows; musk melons; pickled onions; onions; shallots; tomatoes; cucumbers; beans (dry and green); tobacco; potatoes; beet; rhubarb; mint; chillies; carrot seed; onion seed; beet seed; tobacco seed; lettuce seed; cabbage seed; manna seed; watermelon seed; musk melon seed; cucumber seed; aniseed seed; vegetable marrow seed; squash seed; chillie seed; radish seed; corn seed; meal; flour; bran; chaff; barley; mealies: bread, hickory king, sweet corn, yellow dent, and pop corn; kaffir corn; green stalks of mealies; mealie meal; oat sheaf; oat seeds; lucerne.

The Black Wattle and Australian Willow.

THE following letter has been sent to a correspondent by Mr. Claude Fuller, Natal Entomologist, and is published here as it should prove of interest to a number of readers. The photos reproduced herewith are also supplied by Mr. Fuller:—

I have to acknowledge the receipt of your letter of the 27th ultimo and the accompanying specimen which you describe as the foliage of a hybrid between the common Black Wattle (*Acacia mollissima*) and the Australian Willow* (*Acacia melanoxylon*). The question which you raise as to the possibility of such a hybrid being an improvement for tanning purposes is one that I cannot answer, except to say that it is very problematical indeed. You must forgive me pointing out a mistake which, in common with others, you have fallen into. As a matter of fact, the foliage is not that of a hybrid at all, but a by no means unusual feature of the Australian Willow, as I shall proceed to point out.

The foliage common to the Black Wattle and many other wattles, Mimosas and " Thorns ", which takes the form of many small leaflets arranged on either side of a stalk, is said to be *pinnate*. Those we are speaking of are compound bi-pinnate leaves, because there is a common *petiol* or leaf-stalk which bears secondary petiols, upon which the leaflets are pinnately arranged. Now, these characteristic leaves are always to be found upon young plants of the Australian Willow and frequently upon adventitious growths from old trees, more especially when such have been cut back, broken, or bruised. Ordinarily, however, as the growth of *Acacia melanoxylon* becomes set nothing but broad, simple foliage is produced. This, although quite leaf-like in appearance and performing all the functions of the leaves and a normal condition of the species, is not made up of true leaves. Strictly speaking, the foliage is just so many aborted leaf-stalks metamorphosed into a leaf-form, botanically referred to as *phyllodes*.

I enclose a photograph of a series of leaf-forms taken from the spray of foliage sent in by you illustrating various stages of the transformation, and putting the petiolar character of the usual foliage beyond doubt.

There is one feature of this flattening of the leaf-stalk into a blade that I should draw your attention to, and it is that the plane is vertical and not at right angles to the stem, as is so often the case with leaf-blades. This is not correctly illustrated in the photograph, which shows the pinnate leaves pressed into the same plane as the flattened leaf-stalks.

The modification and metamorphosis of leaves is rather usual than uncommon with plants, as soon as one appreciates the facts. Flowers, for example, are but modified leaves. One can easily appreciate the sepals of a rose being but modified leaves, and this is brought home to one more clearly in the case of coarse roses, the tips of whose sepals

* The common names of the plant in Australia are "Blackwood" and "Aunt Sally". The inappropriate term here used is of South African origin. The native plants of Australia popularly designated "Willows", are: *Acacia calamifolia*, *A. salicinia*, *Eucalyptus pilularis*, *Pittosporum phillyraeoides*, and *Geijera parvifolia*.

assume very leaf-like forms. The gay-coloured petals are not so readily recognized as modified leaves, but directly one examines these parts of the green rose, specimens of which are to be seen in many local gardens, the fact is at once acceptable.

One of the most remarkable cases of leaf metamorphosis is illustrated in the pitcher plant, the tips of whose leaves acquire the form of a pitcher with a lid. Perhaps the most common form I can draw your attention to is that of the common pea, in which some of the leaflets are changed into tendrils.

Cattle Dipping Tanks.

FACILITIES FOR FARMERS.

EXPERIENCE in various parts of the Union where East Coast Fever has been raging has shown that one of the best methods of combatting the disease is that of regular and frequent dipping of stock, with a view to destroying the ticks. In the early days of the disease this fact was not so fully recognized, for the simple reason that dipping was not performed at sufficiently short intervals, with the result that the ticks were not destroyed in sufficiently large numbers to make any appreciable impression upon the advance of the disease. The advantages of frequent and regular dipping are now so generally recognized, that facilities are to be provided to farmers by the Government for the purpose of erecting dipping tanks by means of advances out of public moneys, which advances will be repayable by easy instalments and will bear interest at a moderate rate. A Bill for this purpose has been considered by Parliament during the recent Session. This Bill provides that, whenever under any law relating to diseases of stock the Minister of Agriculture orders any person who is the owner of a holding to construct a dipping tank upon his holding, or, again, whenever any owner of a holding is desirous of constructing a dipping tank, such person may apply to the Department of Agriculture for an advance sufficient to defray the initial cost of constructing such a dipping tank (including the cost of materials and the transport thereof to the farm, as well as the cost of construction). Advances are only to be made in respect of proposed dipping tanks the plans and specifications of which are approved by the Department of Agriculture.

These advances will bear interest at the rate of four per cent. per annum, and will be repayable to the Department by equal yearly instalments. These instalments will be so calculated that the whole advance and the interest due thereon will be repaid within such period—not exceeding eight years—as the Minister of Agriculture may prescribe. The first instalment will become due two years after the advance is made, but interest must be paid by the borrower during that period.

Instead of advancing the actual money necessary for the purposes of building the tank, the Bill makes provision for the alternative supply by the Department of the requisite material and the transport of the same by the Department, the cost of these supplies and services being debited against the owner of the holding as if an actual advance in money had been made.

For the purposes of these advances, any number of holdings may be regarded as one holding provided they are contiguous to each other and provided that their aggregate area does not exceed three thousand morgen or such greater extent as the Minister of Agriculture, having regard to the practice of the owners, may determine. This provision enables the owners of adjoining farms to club together for the purpose of erecting a common dipping tank. In such cases, of course, the owners are liable for repayment of the loan in equal proportions, with corresponding interest.

Provision is made for the registration of such advances in the Registrar of Deeds' Office ; and no transfer of a holding will be possible

until a receipt or certificate has been issued by the Department of Agriculture for the interest or instalments payable in respect of the holding.

Section 4 of the Bill provides that whenever an advance has been made under this Act for the construction of a dipping tank upon a holding which is then held under lease from an owner (not being the Crown), such owner shall be entitled to receive from the lessee, as from the date when the construction of the tank is complete, a payment of six per cent. per annum on any sums which such owner has, under Section 2, paid in as instalments in respect of the advance, and the owner shall have the same rights in respect of recovering any such payment as he has in law to recover rent due to him from the lessee.

The Department of Agriculture is empowered to send officers to inspect the carrying out of the construction of the dipping tank ; and if it be considered that undue delay or departure from the plans and specifications has occurred, the Department may cause written notice to be served upon the owner to complete the construction in accordance with the plans and specifications, failing compliance with which on the part of the owner, the Department may have the work completed itself and the cost debited against the owner, to be considered a portion of the advance made. Again, the Department may send officers to inspect dipping tanks erected under the provisions of this Bill, and should any such tanks be found to be in need of repair, it may call upon the owner to execute such repairs, failing which the Department is empowered to carry out the repairs at its own cost and recover the amount by action in a court of law.

Should at any time instalments or interest due under the Act remain unpaid for three months after same is due, the Department of Agriculture may call upon the person liable to repay the whole advance or such portion thereof as may still be due, together with any interest due. The same course may be followed in the case of a person who has appropriated the money or material for other purposes than that for which it was advanced.

Provision is also made for granting facilities for the erection of dipping tanks in native reserves, at mission stations, and in locations not under the control of a native council, and also for the making of advances to local authorities.

Witch-weed or Rooi-bloem.

METHODS OF CONTROL.

By CHAS. W. WEIR, Koedoespoort, Pretoria District.

As the devastation caused by the parasitic plant known in the Transvaal as Witch-weed, or Rooi-bloem, seems to be threatening seriously the development of our maize and sorghum crops in certain parts of the country, perhaps the following notes about it may be of interest, and I trust of use in combating this insidious pest.

Unfortunately for myself, during the last three years I have been confronted with the prospect of having to discontinue the cultivation of our staple crop owing to the ravages of the above pest on the farm which I occupy, and now, having come to the conclusion that it can be overcome, my relief is great.

I had the pleasure of conducting an experiment for Mr. Watt, late Chief Chemist to the Transvaal Department of Agriculture, with a view to ascertaining the efficacy of a 3 per cent. solution of copper sulphate in destroying witch-weed. This proved quite successful in destroying that part of the plant above ground, though I fear that the roots were not destroyed as there were indications that fresh shoots were being sent up from the part of the stem underground. This, however, was not conclusively proved owing to the experiment having been undertaken too late in the season. Should such proof be eventually forthcoming, it is obvious that horse and hand cultivation would be equally effective and much cheaper than spraying. When seed has already formed on the plant I would suggest that sacks be given to the workers in which to put the plants when pulled in order that they may be carried off the lands and destroyed, thus obviating the possibility of some of the seed ripening after the plant has been pulled. Of course, to be effective, the plants must be pulled before any seed has matured, otherwise the work would be practically useless. In my experience, this method could only be followed economically the first year after the breaking up of new land, as when the plant has become abundant after two or three years' growing of maize or sorghums the expense would be prohibitive.

I have, however, come to the conclusion that the following method would be the most satisfactory in eradicating the pest, and, if effective, would have the advantage of being accomplished in the ordinary course of what might be called "good" farming. It is well known that, especially on some of the heavier soils in the Transvaal, and more especially those containing a good deal of iron, when new land has to be brought under cultivation it is advisable to have it broken up during the summer or autumn and subsequently reploughed before seeding in the spring. Where there is danger from witch-weed, this first ploughing should be commenced when the witch-weed has accomplished about half its growth. I am of opinion that this stage is generally reached from the beginning of February to the middle of March, according to season and locality; and the ploughing should be completed shortly after the weed commences to flower in order that no seed may be produced to perpetuate the pest. In this way the seed from the previous season's growth should have germinated, and

by ploughing under before re-seeding, would be finally destroyed. In order to make doubly sure of complete eradication, in the first year after breaking some crop should be grown which would not act as a host for the witch-weed, such as cow-peas, kaffir beans, velvet beans, etc., which could either be used for stock feed on the farm, or marketed as hay or grain, or could even be ploughed in as manure for the succeeding crop at a profit. In any case the land would be enriched by the growth of the legumes, and a superior crop could be expected the following year, especially so if a small dressing of phosphoric acid is applied in the form of superphosphate, basic slag, or other phosphatic manure.

One of the advantages of this procedure is that there is not the same risk of weeds acting as hosts for the witch-weed in new lands, as undoubtedly some of the grasses found on old lands are used by this parasite as hosts.

The foregoing is based on the assumption that the witch-weed found on the veld is the same as that found on the mealie, as I am of opinion that the difference in appearance is due to the different host-plants. I am quite unable to account for its presence and habits in any other way. If such is not the case then the treatment described above must prove ineffective, and we will have to await further scientific investigation into the life history of this plant before satisfactory means of successfully coping with its ravages can be devised.

Laminitis in the Horse.

INFLAMMATION OF THE FOOT, FOUNDER, OR BEVANGEN.

By F. M. SKUES, Government Veterinary Surgeon, Harrismith.

THIS is an inflammation of the sensitive parts of the foot, especially of the laminae. The laminae are the leaves which intimately connect the horny part of the foot with the sensitive structures which it encloses. This is an extremely painful disease owing to the sensitive foot being encased in the unyielding horn, preventing free exudation and swelling from the congested blood vessels which would ordinarily give relief.

The most common cause is over-exertion and galloping on hard roads, drinking cold water when heated or fatigued, feeding with too rich foods, such as wheat, barley, rye, mealies, or new oats. Very often it is due to an animal having stood idle for some considerable time and then suddenly taken on a long journey; it also follows chest or intestinal affections as pneumonia, pleurisy, colic, inflammation of the bowels; also after difficult parturition.

The first symptoms are shivering, blowing, and refusal of food. This is soon followed by stiffness and tenderness, usually of the fore feet; the temperature may then go up to 105° F., or even higher; the pulse is full and hard, and the breathing quick; the pain becomes more intense and the animal often breaks out in sweat in places; it may stand with both fore feet extended as if resting on its heels and the hind legs drawn up well under it so as to relieve the weight as much as possible. Should the hind feet become affected instead of the fore feet, both fore and hind feet are placed under the body and the animal lies down sooner than with anterior laminitis. In anterior laminitis the horse will stand for several days and only move from side to side if left alone, but when it once goes down it shows no inclination to rise. If the affected hoof is struck with a hammer the animal evinces great pain, and if the arteries at the coronet are felt they will be found to throb violently.

The treatment consists in giving the animal a mild purgative, unless the animal is purging already, such as: One pint of linseed oil, or ½ lb. of Epsom salts with a teaspoonful of ground ginger in it, in half a pint of warm water or gruel, to which may be added 30 minims of tincture of aconite if the animal is in great pain. If the pain continues to be severe, the aconite can be repeated every three hours. The shoes should be removed, the feet pared down, and bran poultices, made very wet, tied on to the affected part. The animal should not be tied up in a stall, but placed in a loose box with plenty of straw in it, so that the animal can lie down if so inclined, and it should be warmly clothed to encourage perspiration. The drinking water should be placed handy, in a bucket, where the horse can get at it when it wants to, and an ounce of saltpetre should be dissolved in it twice daily. All heating diet should be withheld and the animal given nothing but bran mashes and green food until the fever has disappeared, and even then it should be restricted.

As soon as the actual symptoms have been relieved and the animal is able to bear weight upon the feet, shoes should be applied. It should be got out and given gentle exercise on soft ground; if the feet are very tender leather soles should be used, and it may be necessary to blister round the coronet and turn the animal out for a couple of months.

In favourable cases there are no structural changes, though the disease is liable to recur, but in unfavourable cases structural alterations occur in the foot from the result of the inflammation. The horny and sensitive laminae become separated, owing to which the coffin bone loses its support and descends on the sole which causes the latter to become convex. These chronic cases require to be repeatedly blistered around the coronet, to be shod with a seated-out shoe, and to have a long run at grass before being worked, and even then they are liable to have a fresh acute attack, but if carefully treated will often last for a long time.

Note on Eradication of Ticks by the Starvation Method.

By H. E. LAWS, B.Sc., F.I.C.

IN a previous article* the writer reported the results of the experiment in connection with the "starvation" method as a means of eradicating ticks. This experiment, it will be remembered, was undertaken in order to ascertain the value of the plan of excluding all stock from a definite area and keeping it enclosed for a considerable period as a practical method for exterminating ticks. The writer was not aware than any work of a similar nature had been undertaken in South Africa previous to his work, until he saw a reference to an experiment carried out by the Cape Veterinary Department which has recently been published,† of the original report of which he can find no trace. In addition to work in South Africa the method has been adopted on an elaborate scale in the United States.

A convenient paddock was selected in the middle of the estate, Gonubie Park, in the East London district, and this was enclosed against all stock in May, 1908. At the time of the publication of the report, the paddock had been enclosed for two years, and although the number of ticks had undoubtedly decreased, the results were far from being so satisfactory as to justify the recommendation of the method as a practical means of disposing of ticks.

Simultaneously with this experiment other work was being carried on in connection with tick eradication, notably the periodic dipping of all live stock running in a number of the other paddocks on the farm, and advantage was taken of the opportunity afforded to compare the results of the two processes. The results of the comparative tests demonstrated beyond all possible doubt that the veld can be cleared of ticks in less time than that required if the method of excluding all live stock is adopted, by heavily stocking and periodic dipping of all live stock running on the veld in an efficient tick destroyer. The advantages from the farming point of view of heavily stocking and regular dipping extend beyond the cleaning of the veld, for during the process of cleansing, the condition of the veld is improved, and, further, ordinary farming can be carried on simultaneously with the dipping operations, whereas farming work must of necessity cease where starvation is being tried.

From the results of experiments which have been made in the laboratory by Mr. Lounsbury, Dr. Theiler, and others, one would conclude that it would be possible by excluding all hosts to exterminate all varieties of ticks within two years; the conditions in the field, however, are such that exclusion of wild hosts is impossible, and it is doubtful whether complete extermination would ever result by the adoption of the starvation method. Our experience proves the impossibility of starving ticks from a large area such as that covered by a South African farm, although it may be possible when smaller

* Laws, H. E., and Manning, B., "Eradication of Ticks by the Starvation Method", *The Agric. Journ. of the Cape of Good Hope*, July, 1910.

† Dixon, R. W., "East Coast Fever", *Cape of Good Hope Official Gazette*, 24th February, 1911.

areas are enclosed. The important point to be borne in mind when considering this question of starvation is that the exclusion of live stock from a definite area does not necessarily embody the exclusion of all available hosts. It is in this connection that the difficulty of obtaining satisfactory results arises, and no system would be perfect unless means are adopted to exclude all game and other available hosts.

In the previous account of this work we reported that the paddock selected for our experiment was divided by a ravine around and over which are growing bushwood and timber, all of which afford covering for buck and other game. About two months before making the previous examination of the camp, the portion surrounding the ravine was burned, and divided from the other portion by means of a fence. After this examination both portions of the paddock were closed, but it was noticed during the winter months of last year that numbers of buck returned to this secluded spot, and although every available attempt was made to drive them out, tick-infested game, particularly hares and duiker, were continually being shot in this portion of the camp. In view of this fact, the idea of exterminating ticks from this portion of the camp by excluding stock was abandoned as hopeless. It was therefore opened up for grazing live stock, which were submitted to the ordinary fortnightly dipping.

The other portion—the unburnt portion—being much more open, and much less frequented by game, was kept closed for further tests. At the last examination, previously reported in the *Cape Agricultural Journal*, which took place in May, 1910, only thirty-seven ticks were taken off the ten beasts after running in the paddock for three days. The presence of the relatively small numbers of ticks compared with those present at the time of the earlier tests, also of those found in the test under consideration, may be accounted for in part by the fact that the test was made in the late autumn; although, of course, this would have no difference whatever upon the value of the comparative tests made, and the results obtained with the starvation and periodic dipping methods, as these tests were done simultaneously. At the same time, it was felt that the result of the 1910 test made in the starvation camp did not indicate sufficiently well the degree of tick infestation of the paddock, so it was decided to make the next test in the summer months at the time when the ticks are most active, hence their relatively large numbers. The one section—the burnt portion—of the paddock having already been opened up for grazing, this experiment refers to the examination of the unburnt section only.

EXPERIMENTAL.

The testing of the degree of tick infestation was carried out in the following manner. Ten quiet oxen, which had not been dipped for seventeen days, were selected for the purpose, and from each of these all the visible ticks were picked off by hand. They were then driven along the road to the gate of the paddock, where each one was sprayed in turn with a mixture of paraffin and water containing 25 per cent. paraffin. This spraying was done in order to ensure the destruction of any small ticks that may have been overlooked in the process of hand picking, and of any others that may possibly have been collected while the cattle were proceeding along the road. The mixture of paraffin and water was selected for spraying in preference to the Cattle Dip on account of the fact that the former kills the ticks

on the cattle but affords no protection against re-infection, whilst the latter, after destroying all those on the cattle at the time of spraying, would prevent a number of ticks from biting for several days. The use of such a preparation as the latter would tend to yield abnormal results, as very few ticks would be inclined to attach themselves until the effects of the dip had to some extent disappeared, however greatly infested the veld may be.

As each beast was sprayed it was driven into the starvation paddock. After spraying the ten oxen the gate of the paddock was closed, the oxen remaining inside from the morning of 21st February until the evening of 23rd February. At the end of this period each beast was tethered within the paddock, and all the ticks picked off and placed in a tube containing a number corresponding to that on the beast ready for examination. When all the ticks had been picked off the cattle were returned to their respective camps from which they were originally taken.*

THE CATTLE.

The following is a description of the oxen used for this experiment:—

1. Young blue ox, low in condition and unhealthy, but skin soft and thin.
2. Young black stirk, very thick skinned.
3. Small young blue ox, white brush, good condition, skin medium.
4. Small black ox, white underline and brush, good condition, skin medium.
5. Thick set small black ox, three white legs, good condition, skin mellow.
6. Small black ox, blind off eye, low condition, skin medium.
7. Large blue ox, white brush, good condition, skin soft.
8. Red and white ox, white brush, good condition, skin medium.
9. Black and white ox, white brush, good condition, skin medium.
10. Old brindle ox, thick skinned.

On referring to the list of ticks it is most interesting to note the variations in the numbers found on the different beasts, in spite of the fact that all the beasts were submitted to exactly the same treatment. The numbers of ticks, it will be seen, range from 20 to 50 for each beast, the average being 34 per head. The cause of this variation can only be accounted for by the selective power of the ticks. Evidence of this power has often been quoted by owners of stock, most of whom have noticed that a thin-skinned beast in low condition will become much more heavily infested within the same period than a medium or thick skinned beast in good condition. Then again, what farmer has not noted this same result after allowing a pair of horses to run on the veld? The one will always be troubled with tick infestation, whilst the other will remain quite clean, both being submitted to exactly the same treatment.

The results of this experiment give us some concrete evidence in corroboration of these general observations, the thin-skinned low conditioned beasts being more grossly infested than the medium and thickskinned beasts in good condition. If the object is to obtain an

* The cleaning and examination of the cattle were done by Mr. R. J. Davys, of Gonubie Park.

average result, it is important in making an experiment of this nature that these phenomena be observed by selecting cattle of varying types and conditions.

The Ticks were then submitted to Mr. L. E. Robinson, A.R.C.Sc., of this laboratory, for identification, and below is given the list of the names of the ticks found, together with a short report by Mr. Robinson.

REPORT ON THE EXAMINATION OF THE TICKS REMOVED FROM THE CATTLE USED IN THE STARVATION CAMP EXPERIMENT.

Ten tubes, containing all the ticks removed from the ten oxen, were handed to me for examination by Mr. Laws. The individual contents of each tube were identified and enumerated, the result being stated in the following table:

Species.		Ticks taken on each Animal.									
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Amblyomma hebraeum	Male ...	1	1	—	1		1	2		—	—
	Female				—			—		—	—
	Nymph		—		—	—	1		—		—
Ixodes pilosus	Male ...	1	1				—				—
	Female	3	2		—	—	1		1	2	—
	Nymph	—	—	—	—				—	—	—
Rhipicephalus simus	Male ...	8	5	10	9	8	5	12	5	5	6
	Female	30	9	13	21	15	25	19	14	20	10
	Nymph		—			1		—			
Rhipicephalus evertsi	Male ...	1			—	1	—	3		2	1
	Female		1		—		—		1	1	—
	Nymph		—	—	—	—		—	—	—	—
Rhipicephalus appendiculatus (1)	Male ...	—		2	2	3	—	6	4	4	6
	Female	4			3	—		—		3	5
	Nymph	—			—	1		—		1	—
Rhipicephalus capensis	Male ...	—			—		2	1		1	1
	Female	2			—			1	3	2	—
	Nymph	—	—	—			—			—	—
Haemaphysalis parmata (2) ...	Male ...		—							—	—
	Female	—	1		2			1			—
	Nymph					—	—		—	—	—
Totals	...	50	20	25	38	29	35	45	28	41	29

Total number found on all ten animals ... 340

(1) Specimens of *Rhipicephalus nitens* included, as synonymous with *Rhipicephalus appendiculatus*, in accordance with Dönitz's recent observations.*

The most striking conclusion to be drawn from this examination is the entire absence of *Boophilus decoloratus* from the list of species found, and, bearing in mind the high degree of specialization to which *Boophilus decoloratus* has attained, in the facts of its peculiar life-history, and in the narrow limitations of its suitable or possible host-animals, its absence is a matter of no surprise.

This is in accordance with Theiler's observations† and corroborates the conclusions drawn from Mr. Laws' previous experimental work.‡

* Dönitz, W. (1910), Die Zecken Südafrikas, Denkschriften der Medicinisch-Naturwiss. Gesellsch. zu Jena, Bd. XVI; Schultzesche Forschungsreise, Bd. IV, Lief. 3, p. 472.
† Theiler, A. (1909), "Diseases, Ticks, and their Eradication," Transvaal Dept. Agric. Farmers' Bulletin, No. 63, pp. 12-13.
‡ Laws, H. E., and Manning, B. (1910), "Eradication of Ticks by the Starvation Method," *Agric. Journ. of the Cape of Good Hope*, Vol. XXXVII, No. 1, pp. 9-17.

On the other hand, all the ticks found are such as are not dependent upon cattle or other domestic animals for a means of subsistence, and which would find sufficient sustenance on the many species of wild animals which, obviously, it would be impracticable to exclude from the starvation camp.

A large proportion of the ticks which were examined, particularly those of the species *Rhipicephalus appendiculatus*, *Rhipicephalus evertsi*, and *Rhipicephalus simus*, were abnormally small, a state of affairs which it may be suggested as being due to the withdrawal of a formerly plentiful food supply. The fact that stock had been freely grazed on this land, prior to the commencement of the starvation experiment, would ensure an abundance of ticks. Then the withdrawal of all cattle would leave only the wild hosts to support this multitude. The great majority would die of starvation, and of the remainder, the struggle for existence, compared with former conditions, would be so severe, that it may be assumed to have affected the progeny of the remaining ticks, hence the large numbers of undersized individuals. This suggests that even if it is not possible to entirely eradicate species other than the Blue Tick by the starvation method, yet their numbers may be so materially reduced that they will no longer constitute a formidable pest.

It will be noted that there were 340 ticks in all on the ten beasts, about 80 per cent. of which were found in the brush, 10 per cent. in and around the ears, and the balance under the stump of the tail and on other parts of the body. As pointed out above, the number of ticks found on this occasion exceeds by far that which was found in 1910, but when one takes into account the fact that the 1910 tests were done in May, whilst the present one was done in February, the results are not at all surprising. On referring to the list, it will be seen that the numbers of *Rhipicephalus simus* exceed those of all the other varieties, in fact the *Rhipicephalus simus* found comprise more than two-thirds the total number of ticks taken from all the cattle, *Rhipicephalus appendiculatus* being the only variety found in greater numbers than two on any one beast. In addition to adults, there were several nymphs of these two species present. It may be pointed out that Mr. Robinson has remarked upon the absence of Blue Ticks (*Boophilus decoloratus*), which fact struck Mr. Lounsbury as being a very important one on reading my 1910 report.* This result is in accordance with one's expectations, as this variety would not, under the circumstances, be able to accustom itself to the altered conditions of life after the customary host had been removed from the camp. The fact that this variety can be exterminated by this means will account for the extensive practice of the method as a practical means of eradicating ticks in America, where the only pathogenic ticks found in large numbers in the Southern States are the *Boophilus annulatus* and *Boophilus australis*, which are similar to the South African Blue Tick.

It is interesting to note that Mr. Robinson has called special attention to the abnormal size of a number of the ticks found on the cattle. This was so general and marked in the vast majority of cases that it cannot be attributed to accident. It is not surprising, however, when one takes into consideration the fact that the cattle have been withdrawn from the paddock for nearly three years, so that for some generations the ticks there have been compelled to rely solely upon wild animals for hosts. This has created an abnormal struggle for existence throughout the successive generations, and this struggle has had its usual effect in producing a smaller type of the same species. As we have intimated above, the hosts, such as game, have never at any time been absent from the camp, although they have never been present in sufficient numbers to enable the ticks to increase.

* Laws, H. E., and Manning, B. (1910), "Explanatory Note on Eradication of Ticks by the Starvation Method," *Ag. Journ. of the Cape of Good Hope*, Vol. XXXVII, No. 1, pp. 16–17.

In fact, according to the evidence obtained from this experiment, it is improbable that with the present number of hosts the degree of infestation will be maintained, although the process of effecting a reduction is necessarily a slow one. There are, it seems, just sufficient hosts to keep the balance in favour of the preservation of ticks—the numbers actually present in the paddock varying considerably according to the season—but these are so few that this balance is only maintained by the fact that each individual tick is capable of waiting at each stage of its cycle a considerable time for a host to feed upon, and it is partly due to these consecutive periods of enforced starvation that the tick becomes undersized.

Comparing the figures with those obtained at the last examination, one would conclude that the ticks have passed the minimum stage and have since increased in numbers. This may or may not be true, but we are inclined to believe that the apparent increase in the degree of infestation of the veld is entirely due to the fact that the recent test was made in February, whilst the preceding one was made in May of last year. Between the months of September and February the ticks have had ample opportunities for breeding during the damp, warm weather, and they are certainly in a much better state under these conditions to resist the effects of enforced starvation. Further, they are more active at this time than later in the season, and can expend greater energies in seeking a host than was possible at the previous test. Between February and May there would be considerable mortality among the unfed ticks, and those remaining would not have the same vitality they had during the warmer periods, consequently all the influences which tend to show that the degree of infestation is abnormally high have departed, and when these have been properly valued we have no hesitation in stating that the paddock is no more grossly infested than it was last year at this time.

The test was made at this time in order to place a true value on these influences and not in any way in order to compare the present state of the camp with that in May of last year, the results at the two periods being incomparable.

We propose, then, to make a further test in May of this year, again in February of next year, repeating the tests for some time at these seasons until we are able to publish some further positive results in addition to those with reference to the Blue Tick. We shall in future attempt to overcome the difficulty of keeping out ground game and other hosts from the paddock by enclosing about two acres in one of the corners where there are neither trees nor bushes. This corner will be thoroughly burnt off, then fenced in by means of a strong 4 ft. 6 in. barbed fence, around the bottom of which will be fastened lengths of wire netting standing three feet from the ground. This netting will be fixed so as to exclude, as far as possible, all animals from this corner of the paddock. This portion of the paddock will be tested simultaneously with but quite separately from the main portion at each period when it is considered advisable to make an examination. By selecting a comparatively small paddock in an open spot from which ground game will be excluded, there is every prospect of our being able to publish some interesting results within a much shorter space of time than has been possible whilst dealing with a large area, portions of which are overgrown with brushwood and other covering.

At the time of the next examination we hope to compare the degree of infestation of the starvation paddock with that of some of the other paddocks on the farm in which regularly dipped cattle have been running for some time.

It will be interesting to discover what progress has been made against the ticks by this method of starvation, and this can only be done at the present juncture by comparing its degree of infestation with that of a camp in the neighbourhood, in which very little, if any, action has been taken in the way of tick eradication. It may be somewhat difficult to find such a paddock in the Gonubie district in these enlightened days, but it is quite possible there may be some neglected spots on which native cattle have been running undipped for an indefinite period.

At any rate, I shall endeavour to secure the use of such a camp in order that I can, at the time of making the next test, run clean cattle in it for the same period as in the starvation paddock, and compare results after the cattle are taken out. Such an experiment will tell us what effect the method of starvation has on the number of ticks, and will considerably enhance the value of the data already published.

The Cooper Laboratory for Economic Research,
Watford, England, 7th April, 1911.

APPENDIX.

Whilst working on the subject of ticks and their eradication in South Africa the writer has often had occasion to refer to publications and general literature in connection with this work in order to refresh his memory on different points regarding the life-history of the various species of ticks, and the periods of incubation of the disease which they transmit.

Before obtaining the information desired it has often been found necessary to read through an enormous number of papers, which obviously involves a great waste of time, beside being extremely laborious. In order to avoid as far as possible this unnecessary labour it has occurred to the writer—and no doubt other workers have found the need for it too—that it would be a tremendous assistance to those interested in the subject of ticks, both professionally and as practical farmers, if tables were compiled giving the more essential points in connection with the habits and life-histories of ticks and the diseases which they transmit, so that one can refer to them without finding it necessary to read through an enormous amount of detail before arriving at the actual information required.

The writer has discussed this with Mr. Robinson of this Laboratory, and the latter has been good enough to draft two tables, No. 1 showing the relation between South African Pathogenic Ticks and the diseases which they transmit, No. 2 showing the periods occupied by the various phases of the life-history of some South African Pathogenic Ticks.

In order that the tables may be of service to the practical man, as well as others, Mr. Robinson has inserted the popular names of the diseases as well as those of the ticks which transmit them.

TABLE I.—RELATIONSHIP BETWEEN DISEASES AND THE SOUTH AFRICAN PATHOGENIC TICKS WHICH TRANSMIT THEM.

Disease.	Causative Organism.	Incubation Period.	Susceptible Animals.	Duration of Infectivity in Recovered Animals.	Species of Ticks Transmitting Infection.	Geographical Distribution.	Hosts.	Moults.	Phase of Life-History of Tick at which Disease is Transmitted.
Redwater	*Piroplasma bigeminum*	17–18 days	Cattle	12 years and more	*Boophilus decoloratus* (The Blue Tick)	South Africa to Central Africa	Cattle; other domestic animals occasionally	1st, on } 2nd, on } host	Larva.
					Rhipicephalus appendiculatus (The Brown Tick)	Ditto	Cattle; horses; other domestic animals; antelope; hare: etc.	1st, off } 2nd, off } host	Larva.
East Coast Fever	*Piroplasma (Theileria) parvum*	10–20 days	Ditto	Non-infe[illegible]e after recovery	*Rhipicephalus appendiculatus*	Ditto	Ditto	Ditto	Nymph and adult.
					Rhipicephalus capensis (The Cape Brown Tick)	South Africa	Cattle and other domestic animals	1st, off } 2nd, off } host	Ditto.
					Rhipicephalus simus (The Black-pitted Tick)	Africa	Cattle and other domestic animals; wild animals	Ditto	Ditto.
					Rhipicephalus evertsi (The Red Tick)	Africa	All domestic animals, excepting pig; many wild animals	1st, on } 2nd, off } host	Adult.

* Dönitz, W. (1910). Die Zecken Südafrikas, p. 430.

Disease.	Causative Organism.	Incubation Period.	Susceptible Animals.	Duration of Infectivity in Recovered Animals.	Species of Ticks Transmitting Infection.	Geographical Distribution.	Hosts.	Moults.	Phase of Life-History of Tick at which Disease is Transmitted.
Gall-sickness	*Piroplasma mutans*	3–4 weeks	Cattle	Infectivity retained after recovery	*Rhipicephalus appendiculatus*	See above	See above	See above	Nymph and adult.
					Rhipicephalus simus	Ditto	Ditto	Ditto	Ditto.
					Rhipicephalus evertsi	Ditto	Ditto	Ditto	Adult.
Spirochaetosis	*Spirochaeta theileri*	—	Cattle, Horse, Sheep	Ditto	*Boophilus decoloratus*	See above	See above	See above	Larva.
					Rhipicephalus simus	Ditto	Ditto	Ditto	Nymph and adult.
Biliary Fever of Horse	*Piroplasma equi*	—	Horse	Ditto	*Rhipicephalus evertsi*	Ditto	Ditto	Ditto	Adult.
Malignant Jaundice of Dog	*Piroplasma canis*	—	Dog	Ditto	*Haemaphysalis leachi* (The Cape Dog Tick)	Africa, Southern Asia, Australia	Dog	1st, off host 2nd, off host	Ditto.
Heartwater	Unknown	About 15 days	Sheep, Goats, Cattle	Non-infective after recovery	*Amblyomma hebraeum* (The Bont Tick)	South Africa to Central Africa	All domestic and many wild animals	Ditto	Nymph and adult.

TABLE II.—PERIODS OCCUPIED BY THE VARIOUS PHASES OF THE LIFE-HISTORY OF SOME SOUTH AFRICAN PATHOGENIC TICKS.

Species.	Dropping off of replete female to egg-laying.	Time from egg-laying to hatching out of larvae.	Time larvae can exist without feeding.	Time to dropping off of larvae on repletion.	Time on ground for first moult.	Time to dropping of nymph on repletion.	Time nymph can exist without feeding.	Time on ground for second moult.	Time adult can exist without feeding.	Time to dropping of adult females on repletion.
Boophilus decoloratus **(the Blue Tick)**	5 days or more according to season	3 – 6 weeks more in winter	6 months..	—	—	—	—	—	—	3 – 4 weeks from commencement of larval feeding.
Rhipicephalus appendiculatus **(the Brown Tick)**	6 days....	28 days to several months	7 months..	3–8 days..	About 21 days	3–7 days..	6½ months	About 18 days	9½ months	4–7 days.
Rhipicephalus nitens **(the Shiny Brown Tick) ***	—	—	—	—	—	—	—	—	—	—
Rhipicephalus capensis **(the Cape Brown Tick) ***	—	—	—	—	—	—	—	—	—	—
Rhipicephalus simus **(the Black-pitted Tick) †**	—	About 30 days	—	—	About 20 days	—	—	About 25 days	—	—
Rhipicephalus evertsi **(the Red Tick)**	—	About 30 days	7 months..	—	—	—	—	About 24 days	1 year.....	—
Amblyomma hebraeum (the Bont Tick)	2 weeks to more than 3 months	10 weeks to 10 months	7 months..	4 – 20 days mostly from 5–7 days	About 25 days to 4 months	4–20 days	6 months	25–160 days	7 months	10–20 days.

* Life cycle resembles that of *Rhipicephalus appendiculatus*, according to Theiler.
† *Rhipicephalus simus* usually feeds on small wild animals during its larval and nymphal stages.

Cream Cheese.

IN response to an inquiry by a correspondent, the following particulars as to the manufacture of cream cheese are republished from Farmers' Bulletin No. 67 of the Transvaal Department of Agriculture (by Mr. R. Pape, Superintendent of Dairying):—

The name "cream cheese" is used for various products sold in different shapes and made in different ways. The recipes for making cream cheese vary very much accordingly. Here follow a few:—

Sour cream is hung up in a linen bag to drain off the whey. This gives a fairly firm product, which is pressed in moulds. Though it produces a palatable article, it is not fit for the trade, as the product does not keep long enough.

In France full milk is curdled by means of rennet, and left to drain. Then the curds are put into moulds in fine linen and left to drain for a further two hours. After this it is promptly sold. The curd is eaten with cream.

Other varieties are prepared in a similar manner, though with this difference, that curd and cream are well mixed, pressed in moulds, and sold in different shapes and under different names. These modes of manufacture are less important to the Transvaal, as such "cream cheese" keeps for a very short time only, and should be sold and consumed very soon after production. Transit over long distances is not very feasible.

But from cream a variety of cheese can be made which keeps for a longer period. The following is the recipe:—The cream is put into the cheese kettle, as *fresh as possible*, at a fairly low temperatue, say 27° to 28° C. (80° to 82° F.). Now so much rennet powder or rennet extract is added to make the cream take a few hours to "thicken", say two to five hours.

I cannot mention an exact quantity of rennet, as rennet powders and rennet extracts vary so considerably in strength. An experiment will soon show how much rennet is required. By means of fairly intricate formulae it is possible to calculate the quantity of rennet required once the strength is known, but an experiment is much simpler than the calculation. After adding the rennet the cream is well stirred for a few minutes, covered with a gauze, and left.

When the cream is "thick" enough it is ladled into moulds in which fine cheesecloth (linen) has been put. The cheese is pressed now to obtain the required firmness, and then the outside is strewn over with pure, fine salt. Then the cheese is left for some time in a fairly moist, dark locality to give the salt the opportunity to penetrate into the cheese.

In this country an "imitation" cream cheese is sometimes made by mixing full milk with the cream. I have even seen cases where so much milk was used that it really came to adding a little cream to the milk. This way of making is, naturally, cheaper than the use of pure cream, but the result is a lower-grade product, which cannot compete with the real cream cheese.

In closing, a warning! Cream cheese is not a product for oversea export, and the South African market for this article is very limited. For a few people it may be a remunerative business, but if many farmers start making cream cheese the market will soon be glutted, and the price will go down in consequence.

Coffee Cultivation.

A CORRESPONDENT in Pondoland West asks to be supplied with information on coffee cultivation, with especial reference to Pondoland, within twenty-five miles of the coast. Coffee has been tried in Natal, and many years ago it flourished for a time; it was, however, devastated by disease, and the industry, though since revived, is now carried on in that Province on a very limited scale. In reply to correspondent's inquiries, Mr. R. W. Thornton, the Government Agriculturist (Cape), supplies the following memorandum:—

There are two varieties of coffee grown, viz., *Coffee Arabica* and *C. Liberica*, commonly called Arabian or Common Coffee and Liberian respectively. The latter is of higher flavour and aroma, and is gradually becoming more popular with growers.

Origin and where procurable.—It originated, as its name implies, in Arabia, and is now grown in most tropical countries, but chiefly in the West Indies and South Amercia. The seed is obtainable at the Royal Palm Nurseries, Oneco, Florida, U.S.A.

Weight per bushel.—A bushel of ripe berries will produce about 10 lb. of marketable coffee.

Suitable soil.—Coffee thrives on a variety of soils, but a deep rich soil with plenty of humus gives the best results. Clay soils are also suitable. It should be well hilled and drained. A gravelly soil and sub-soil, if virgin, will produce shrubs till about four years, when the trees begin to decline and finally die, due to the greater tendency for the washing out for the plant foods in light soils. The best soil is virgin bush or forest land.

Climate.—Coffee prefers a humid atmosphere where it gets from 50 to 200 inches of rain per annum, but it has been grown with less, and altitude from 1500 to 2500 feet above sea-level, and an average temperature of 60° with the absence of frost. Severe frost kills coffee.

Preparation of soil.—In preparing the land the ground should first be cleared, then well ploughed, and allowed to lie for some time. During the period it is fallowed it should be well cultivated to bring it to as fine a condition as possible.

Selection of site.—In selecting a site for coffee a place should be chosen which is protected from the prevailing and cold winds. If this is not obtainable screens should be planted of some quick-growing tree, such as Lombardy Poplar and Japanese Privet.

Seed-beds : Locality and preparation.—In preparing the seed-bed it should be put into a shady spot, and the ground, preferably of a sandy nature, well worked to bring it to a fine tilth. The beds are best laid out four feet wide, with a path between so as to facilitate weeding and watering.

Planting seeds.—The bed should be well watered the evening previous to sowing. The seeds are pressed lightly into the soil about two inches apart each way. The bed should then be sprinkled freely with wood ash and again watered. A cover should be used to protect the young seedlings from the noonday sun. A screen run on wires about three feet above the bed is found very effectual. This should be removed gradually, until

finally the young plants are exposed to the sun. This method gives good, strong plants, and prevents succulent growth. One bushel of parchment coffee (seed with inner skin attached) will yield about 30,000 plants, which are about enough to plant thirty-five acres, giving a good margin for accidents. When the first round leaves show, which is in about ten weeks from the time of planting the seed, the young plants should be transplanted into nursery beds, which are similar to the seed-beds. Only those plants should be transplanted that have a straight, well-developed taproot. This taproot is cut to about four inches long, and care must be taken to prevent the roots being exposed to the sun. In setting out, care must be exercised that the plant is not put deeper than it stood in the seed-bed, also that it is planted straight. The plants are set out about six inches all ways. These beds should be watered after transplanting and kept moist when weather is dry.

Transplanting.—The plantation must be carefully marked out where the plants are to stand, and a distance of eight to nine feet between the rows all ways is considered best. This allows of cultivation with light machinery to keep down the weeds, and thus save hand hoeing. A hole is made about two feet square, and the subsoil placed on one side. When planting, only the surface soil is placed back in the hole, the necessary amount being collected round the hole, and the subsoil takes its place. The young plants should be strong. The time for transplanting is during the rainy season, September or October, about twelve months after the seed has been sown. When the ground is ready great care must be exercised in keeping the roots of the transplants protected from the sun, and again to keep the plant upright and not put it too deep in the soil. Only upright-growing plants should be used. When planting is finished put a small branch on the sunny side, which will greatly help the young plant making a start. All misses must be replanted to get a uniform plantation. If any side-shoots should have grown on these transplants they must be carefully removed, and the single stem only left.

Training and pruning.—This is a very important point, for on this depends the facility of gathering the future crops. If any laterals should grow out, they are pinched back, and any superfluous branches removed. When the plant has reached about five feet in height it should be topped, and never allowed to grow higher. It will then grow laterally and subsequently meet the other bush. Subsequent attention is necessary to remove dead wood, and at the beginning of the growing season to remove water shoots, which grow inside the bush, so as to keep it open to allow of free access of light.

The age of bearing.—Under ordinary circumstances the shrubs will come into bearing at three years old, and in their sixth will be in full bearing. With ordinary care and attention they will keep in bearing for many years. They have been known to bear annually for twenty years in Australia.

Crop.—Each shrub bears from 3 to 5 lb. berries, and an acre will produce about 5 cwt. upwards of marketable coffee according to the strength of the shrubs and fertility of soil.

Gathering.—The berries are ripe and ready to pick when they turn red or nearly purple. If left after this they drop. There are two ways of gathering :—(1) To place a sheet under the shrub and shake the shrub, but this method is not recommended, as it tends to loosen and bruise the surface roots ; (2) to pick by hand into baskets, which takes longer, but

is the best in the long run. A person can pick 100 to 150 lb. a day, which will yield 12 to 18 lb. marketable coffee. The berries have a tendency to get smaller the nearer they are to the tip of the branch, and some growers grade in the picking by putting those berries at the tip in one basket, the middle ones in the next, and the base ones in the third basket.

Treatment.—After gathering, the berries are subjected to one of two treatments :—(1) They are dried immediately and put through hullers to extract the bean ; (2) they are pulped immediately they are picked by machinery to remove the outer skin. They are then put in tanks and allowed to ferment for about thirty hours to remove the saccharine matter, after which they are subject to a washing process and put on trays or floors in the sun and allowed to dry to the point of storing safely. They are then put in drying drawers or trays and put out to dry every day and taken in at night. If rain threatens they are put under cover again. During this process the berries are constantly turned. As soon as the coffee is dry, that is when it is brittle enough to break between the teeth, it is either hulled or left in the parchment. It is hulled and polished by the merchants who buy the coffee.

Enemies.—It is subject to a few insect pests and fungi diseases, which all go down before treatment.

The world's production in 1906 was 16,741,215 bags of 132 lb. each.

References.—"Cyclopedia of American Agriculture"; "New South Wales Agricultural Gazette".

An Explanation of the Divining Rod Problem?

MESSRS. BATTENHAUSEN BROS., of Britstown, forward a cutting taken from the *Deutsche Landwirtschaftliche Presse,* under the above heading, of which the following is a translation:—

In the February number of "Prof. Dr. Gustav Jager's Monthly Journal" Prof. Dr. Gustav Jager and Prof. Dr. Karl Endrisz show how they both, quite independently from each other—Jager through the domain of Biology, Endrisz through the domain of Geology—arrived at the same conclusion with regard to the divining rod, above all the same conviction, namely, that the phenomenon of the divining rod represents in the first place a biological process in which the organ of smell is the essential agent.

In the third edition of the book "Discovery of the Soul", which appeared in 1885, Gustav Jager writes:—

"The oscillation of the divining rod is founded on the fact that the inhaled scent of an object gives a stronger amplitude to the involuntary movements of the limbs, and whether this is the case depends not only on the individuality, i.e. the *self-scent* of the holder of the divining rod, but also on the nature of the scent of the object; for these movements arise from the encounter and the relation of these two scents. That an animal can do with its nose what the holder of a divining rod does is proof that it is the smell, i.e. the evaporation of the hidden object, which influences the holder of the divining rod, because he inhales it, even if he does not perceive it with his sense of smell."

Quite independent from this purely theoretical explanation of Jager, which for the first time connects from a scientific point of view, the cause of the oscillation of the divining rod with the action of the smelling organs, Endrisz, after many trials with the divining rod, which for the greater part he carried out himself, although several others participated with their rods, arrived at the positive conclusion that when the nose of the holder of the rod is closed he is unable to find hidden objects. By further experiments Endrisz was able to prove that catarrhal affection of the nose influenced the certainty of the working of the divining rod in a great measure, and further, that if the holder of the rod takes in strong scents, which over-excite or stupefy the smelling nerve, even if his smelling organ was quite healthy before, the working of the divining rod is also very uncertain.

These facts are worthy of notice, and it is to be hoped that other scientific bodies will be induced to take up the problem of the divining rod, which Endrisz is investigating further, in order to find out the curious processes of nature which influence the divining rod, and especially to explain the problem with regard to the domains of "matter" and "dynamic". From further careful investigations of this problem we may also expect interesting elucidations of the mutual relations of biological and chemico-physical phenomena.

Weights of Grain and Seeds at the Johannesburg Show, April, 1911.

By J. A. T. WALTERS, B.A., Assistant Botanist.

THE following are the weights per bushel of the entries which took first prizes in the Produce Section as compared with the standard weights in England and America:—

Wheat—	*Weight per bushel.*
Dryland winter wheat, Transvaal grown ...	61 lb.
Dryland summer wheat: Transvaal grown	
Red Victoria	63½ ,,
Red Fife	64½ ,,
Zwaartbaard	63 ,,
Wol koren	68 ,,
Klein koren	67½ ,,

The standard weight per bushel throughout the United States of America is 60 lb. The average at Rothamstead, for eight years, was 61¼ lb., and at Edinburgh, for thirteen years, 62¼ lb. It will thus be seen that the samples exhibited were excellent in quality.

Oats—	*Weight per bushel.*
River Plate	35½ lb.
Algerian	33½ ,,
Boer oats	38 ,,
Sidonian	35 ,,

Here, with the exception of Boer oats, the weights are lower than the best English oats, which vary from 35 to 52 lb. per bushel, with an average of over 40 lb. to the bushel. The standard weight in America is 32 lb. to the bushel.

Barley—

Chevalier ... ... 52 lb. per bushel.

The average for this variety in England is 55 lb. The standard weight per bushel in the United States of America for all varieties varies from 47 to 50 lb.

Barley wheat (Hordeum trifurcum) ... 65½ lb. per bushel.

Rye ... ... 60 ,, ,, ,,

This was a particularly good sample of rye and compares very favourably with English rye with an average of 54 lb. to the bushel. The standard weight in the United States of America is 54-56 lb.

Buckwheat ... ... 54 lb. per bushel.

Standard weight in the United States of America varies from 42-56 lb., but 50 lb. is the average in England.

Kaffir corn	62½ lb. per bushel.
Boer manna	52½ ,, ,, ,,
Golden millet	57½ ,, ,, ,,
Linseed	56 ,, ,, ,,
Soy beans	57½ ,, ,, ,,

A sample of southern soy beans grown at the Botanical Experiment Station, Skinners Court, Pretoria, this season, weighed 59 lb. to the bushel.

Sunflowers ... ... 33 lb. per bushel.

Considerably above the average, which is usually 30 lb. to the bushel.

Teff grass ... ... 69 lb. per bushel.

This was the heaviest weight per bushel of any seed. The second prize sample weighed 68¼ lb.

Good weight per bushel is an indication of well-grown, carefully-cleaned seed likely to give high germination. Low weight per bushel may be the result of damage done to the crop by drought, hail, or rust, resulting in badly-filled ears.

Sunshine at Kimberley.

By J. R. SUTTON, Sc.D.

THE theory has been advanced that the productiveness of our South African soil, such as it is, is due as much to the sunshine as to its actual fertility judged from a chemical standpoint. However that may be, it is probable that farmers as a rule would prefer less sunshine and more rain.

The present paper—which is a portion of a larger investigation now in progress—gives the principal results of seventeen years of observation of sunshine made at Kimberley. The instrument from which the records were obtained is of the Jordan type, and is so constructed that the sun is made to photograph its own path across the sky. Some comparative observations were made with a Campbell-Stokes recorder (lent by the Meteorological Commission), in which the sun burns its own record upon specially prepared cardboard. The heat rays from the sun are more effective than the photographic rays when the sun is low down, consequently the latter instrument indicates more sunshine in the early morning and late afternoon, but less at other times. It results from the comparison between the two instruments that the total duration of all sunshine at Kimberley is upwards of 1 per cent. more than the values obtained photographically. There is also a small additional loss of record owing to some obstruction of the horizon by trees. Making all allowances it would appear that the total duration of sunshine at Kimberley is some 80 per cent. of the optimum; or, to put the matter in another way, the sun is only obscured by cloud for 20 per cent. of the time during which it is above the horizon. The photographic record, as given in Table 1, shows a mean value of 78 per cent.

Annual values of sunshine are given below in Table 1 for seventeen years, 1894-1910; also, for comparison, the rainfall totals for the same period, together with the annual mean cloudiness of the sky for each year expressed in percentages, and the amounts of evaporation from the surface of a large tank for the fourteen years, 1897-1910. For the first three years of cloud results (i.e. 1897-1899) the cloud percentages were derived from three observations a day, at 8 a.m., 2 p.m., and 8 p.m.; afterwards from six observations a day, at 8 a.m. and 11 a.m., and 2, 5, 8, and 11 p.m.

According to the results set out in Table 1, the total duration of sunshine varies from one year to another between 72 and 83 per cent., while the cloud ranges from 24 to 37 per cent. On the whole, the area of sky obscured by cloud varies roughly in an inverse manner to the duration of sunshine. That is to say, the years of most sunshine are the years of least cloud. It is, of course, not an exact rule because clouds do not necessarily obscure the sun. The rainfall and evaporation totals correspond fairly well with one another, but show no very decided relationship to the sun or cloud numbers. Thus, for example, of the two sunniest years of the series, 1902 and 1903, one was a wet year and the other exceptionally dry.

Table 2 gives the average monthly percentages of sunshine and cloud, and also the average monthly totals of rainfall and evaporation. The winter months show a matter of 84 per cent. of sunshine, while the cloudiness drops to 17 per cent. February has the greatest amount of cloud, 44 per cent., and the least sunshine, 71 per cent. There is also a small secondary maximum of cloud in October, corresponding with a secondary minimum of sunshine: 36 and 78 per cent. respectively. The rainfall and evaporation numbers call for no special comment here.

Table 3 gives the average duration in minutes of sunshine for each hour of each month. If we examine this table carefully hour by hour we get the curious fact that the great differences in the monthly averages of sunshine shown in Table 2 (such as the difference between 71 per cent. in February and 84 per cent. in June) depend almost entirely upon the variation of the duration of sunshine in the afternoon. Thus between X and XI o'clock there is no great difference, in point of duration, between the summer and winter sunshine. Between XV and XVI o'clock (=3 p.m. and 4 p.m.), on the other hand, there is a great contrast between the sunshine totals of the two seasons. In the summer we get the most sunshine about X, whereas in winter this maximum continues into the late afternoon. Taking the years through the hour X-XI is the brightest hour of the day.

Of the routine hours of observation of cloud XXIII (=11 p.m.) shows the least cloudiness, and XIV (=2 p.m.) the most. There is, however, no such approach to equality in the cloud percentages at XI of the different seasons as the approach to equality in the sunshine values at this hour might lead us to anticipate. There is, in fact, twice as much cloud in summer at this hour as there is in winter.

TABLE 1. ANNUAL AMOUNTS OF SUNSHINE, CLOUD, RAIN, AND EVAPORATION AT KIMBERLEY.

YEAR.	SUNSHINE.		CLOUD.		RAINFALL.				EVAPORATION.	
	Total.	Deviation.	Total.	Deviation.	Total.	Deviation.	Total.	Deviation.	Total.	Deviation.
	%	%	%	%	inches.	inches.	days.	days.	inches.	inches.
1894... ...	74	—4			24·510	+6·495	84	+ 7		
1895... ...	76	—2			15·600	—2·415	81	+ 4		
1896... ...	72	—6			21·070	+3·055	92	+15		
1897... ...	80	+2	24	6	8·850	—9·165	49	—28	81·747	+18·779
1898... ...	78	0	28	2	18·290	+ ·275	79	+ 2	68·920	+ 5·952
1899... ...	76	—2	30	0	19·385	+1·370	100	+23	61·180	— ·788
1900... ...	78	0	30	0	18·780	+ ·765	81	+ 4	55·209	— 7·759
1901... ...	80	+2	29	—1	22·230	+4·215	79	+ 2	56·396	— 6·572
1902... ...	83	+5	25	—5	22.240	+4·225	81	+ 4	60·502	— 2·466
1903... ...	83	+5	26	—4	12·245	— 5·770	63	—14	65·619	+ 2·651
1904... ...	78	0	30	0	17·510	— ·505	69	— 8	59·494	3·474
1905... ...	77	—1	34	+4	14·060	—3·955	75	— 2	62·563	·405
1906... ...	82	+4	29	— 1	17·675	·340	64	—13	62·698	·270
1907... ...	77	1	34	+4	25·100	+7·085	98	+21	56·513	- 6·455
1908... ...	80	+2	27	—3	12·920	—5·095	67	10	66·935	+ 3·967
1909... ...	76	—2	37	+7	20·390	+2·375	77	0	58·057	— 4·911
1910... ...	77	—1	35	+5	15·440	—2·575	66	—11	65·713	+ 2·745
MEAN ...	78		30		18·015		77		62·968	

TABLE 2. AVERAGE MONTHLY PERCENTAGES OF SUNSHINE AND CLOUD, AND AVERAGE MONTHLY TOTALS OF RAIN AND EVAPORATION.

	SUNSHINE.	CLOUD.	RAINFALL.		EVAPORATION.
	%	%	inches.	days.	inches.
January	72	42	3·017	11·6	8·321
February	71	44	3·072	10·8	6·347
March	73	38	3·040	11·6	5·354
April	79	29	1·760	7·7	3·732
May	80	25	·854	4·8	2·645
June	84	19	·233	2·0	2·032
July	84	17	·252	1·8	2·302
August	84	17	·118	1·4	3·413
September	80	28	·813	2·9	4·914
October	78	36	·997	5·8	6·639
November	78·5	32	1·491	6·6	8·203
December	75	38	2·369	9·8	9·066

TABLE 3. AVERAGE DAILY DURATION OF SUNSHINE FOR EACH MONTH IN HOURLY VALUES.

	V	VI	VII	VIII	IX	X	XI	noon	XIII	XIV	XV	XVI	XVII	XVIII	XIX Day.
	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	min.	minutes.
January ...	22	46	49	50	51	51	50	49	46	44	41	39	37	19	595
February ...	16	42	47	49	50	51	49	48	46	44	41	38	33	8	555
March ...	1	36	48	50	51	51	50	48	46	45	43	40	30	1	539
April ...		18	49	51	52	53	53	52	51	49	48	45	17		538
May ...		3	46	51	52	53	53	53	53	52	50	44	4		514
June ...			41	53	54	55	55	55	55	55	55	41			520
July ...			43	54	56	56	56	56	56	56	54	44	1		531
August ...		8	49	55	55	56	56	56	56	56	55	50	10		563
September		25	49	52	54	54	54	53	53	52	51	49	25		572
October ...	4	44	49	52	53	53	52	51	51	50	48	46	40	4	599
November ...	19	49	52	54	55	54	52	52	50	49	47	45	42	17	639
December ...	27	48	50	52	53	53	51	50	47	45	44	42	40	23	625
MEAN ...	7	26	48	52	53	53	53	52	51	50	48	44	23	6	566

TABLE 4. AVERAGE DAILY PERCENTAGE OF CLOUD AT SIX DIFFERENT HOURS DURING THE DAY.

	VIII	XI	XIV	XVII	XX	XXIII	Day.
	%	%	%	%	%	%	%
January	34	37	51	49	42	35	42
February	36	40	53	52	43	40	44
March	33	36	46	43	36	32	38
April	28	26	37	31	27	22	29
May	28	27	29	26	18	20	25
June	23	24	21	20	15	17	19
July	19	19	19	17	14	13	17
August	19	18	20	17	13	12	17
September	29	36	34	36	21	24	28
October	30	36	41	40	30	28	36
November	25	33	41	40	29	26	32
December	31	35	48	44	38	32	38
YEAR	28	31	37	35	27	25	30

Dairy Herd Records.

THE following are the milk records of the dairy herds at the Elsenburg Agricultural College, Cape Province (for March), and the Experimental Farms at Tweespruit and Grootvlei, Orange Free State (for February):—

ELSENBURG COLLEGE.

Breed and Name of Cow.	Days in Milk.	Yield in Lb. During March.	Yield in Lb. Total to Date.	Yield in Lb. Daily Average.
FRIESLANDS.				
Cleopatra	342	193	8049	23·5
Romula	298	256	5033	16·8
Violet	254	29	6190	24·3
Vera	254	350	5974	23·5
Belladonna	230	214	5648	24·5
Rose	196	595	6285	32·0
Bell	125	697	3814	30·5
Veronica	102	601	2554	25·0
Boerin	75	459	1313	17·5
Cato	34	417	471	13·8
Victoria	6	194	194	32·3
JERSEYS.				
Gwendolen	328	83	5338	16·2
Grace	329	175	5366	16·3
Gus...	287	257	5000	17·4
Petunia	264	95	3673	13·9
Gilliflower...	265	142	4583	17·2
Fanny	254	211	4472	17·6
Evelyn	212	285	2861	13·5
Glee	195	449	4413	22·6
AYRSHIRE.				
Queen Dot...	218	194	4354	19·9
SHORTHORN.				
Helen	192	243	2218	11·5
CROSSES.				
Bessie	276	35	8778	31·8
Disa	287	497	7311	25·4

Average percentage of Butter Fat:

Friesland	3·14 per cent.
Jerseys	5·00	,,
Shorthorns	4·00	,,
Ayrshires	3·95	,,

TWEESPRUIT EXPERIMENTAL FARM.

Breed and Name of Cow.	Date Last Calving.	Lb. Milk.	Fat Test.
FRIESLANDS.	1910.		
Rinske III.	16th September	996	3·8
Nora	20th October	1037	3·4
Japke	11th June	647	3·7
Gertje	23rd November	783	3·7
Dijkstra	13th December	929	3·0
	1911.		
Anna II.	10th January	853	3·4
LINCOLN REDS.	1910.		
Dirce	30th June	214	4·4
Daphne	22nd December	692	3·8
Clusia	26th August	337	3·4
Bracebridge	10th October	402	3·7

GROOTVLEI EXPERIMENTAL FARM.

Breed and Name of Cow.	Date Last Calving.	Lb. Milk.	Fat Test.
SOUTH DEVONS.	1910.		
Primrose	13th October	673	3·4
Opal	10th November	529	4·4
Merry Glass	19th November	721	3·5
	1911.		
Bertha	January	873	3·5

Western Province Agricultural Society.

THIRD EGG-LAYING COMPETITION.

(Commenced 1st May, 1910; to finish 30th April, 1911.) (Four Birds to a Pen.)

Record for MARCH, and Totals to end of March, 1911.

Pen Number.	Owner.	Breed.	Record for Month. Eggs.	Record for Month. Weight. oz.	Record for Month. Weight. dwts.	Total to Date. Eggs.	Total to Date. Weight. oz.	Total to Date. Weight. dwts.	Position to Date.
1	W. P. Cowan....	White Leghorns (Eng.).......	48	98	4	494	943	5	5th
2	B. Kauffmann...	Brown Leghorns.............	49	93	11	464	862	7	8th
3	K. B. Jobling....	White Wyandottes...........	14	28	15	361	702	4	16th
4	R. G. Hudson...	Brown Leghorns (1 dead).....	31	63	12	283	568	11	32nd
5	K. B. Jobling....	White Leghorns (Aust.-Amer.).	33	71	4	416	817	12	10th
6	S. A. West......	White Leghorns (Amer.)......	14	30	3	386	784	4	12th
7	A. F. Rackstraw.	White Wyandottes...........	21	45	13	188	391	0	47th
8	J. W. Wright....	White Wyandottes...........	39	75	1	283	535	4	34th
9	R. W. Hazell....	Columbian (1 dead)..........	24	51	3	154	309	11	50th
10	S. A. West......	White Leghorns (Amer.)......	21	44	9	351	706	7	15th
11	C. H. v. Breda...	White Leghorns (Amer.)......	18	38	4	283	588	0	29th
12	S. C. Skaife......	White Wyandottes...........	45	84	11	348	638	4	21st
13	R. W. Hazell....	White Orpingtons...........	22	49	2	228	476	9	42nd
14	Clif. Hoole......	Buff Leghorns...............	26	50	13	316	616	5	26th
15	F. T. Hobbs.....	Silver Wyandottes...........	38	68	6	271	501	2	39th
16	B. Kauffmann...	Black Minorcas (1 dead)......	11	25	7	174	386	12	48th
17	S. C. Boyes......	White Leghorns (Amer.)......	15	30	1	503	997	4	3rd
18	A. Aitken.......	White Leghorns (Amer.)......	38	75	11	525	1007	1	2nd
19	F. Muller.......	Black Minorcas..............	Nil	—		164	338	0	49th
20	B. Kauffmann...	Brown Leghorns.............	31	59	7	339	617	11	25th
21	R. W. Hazell....	White Wyandottes (1 dead)...	29	59	3	226	454	14	44th
22	J. P. Seabrook...	Blue Andalusians............	36	74	4	369	754	9	13th
23	S. A. West......	Red Sussex.................	35	66	2	270	504	10	38th
24	R. W. Hazell....	White Wyandottes...........	45	91	6	346	691	9	18th
25	J. Leibbrandt...	White Wyandottes...........	15	29	11	279	554	2	33rd
26	R. G. Hudson...	Black Wyandottes...........	34	66	4	339	644	6	20th
27	H. H. Bright....	White Leghorns (Eng.).......	26	52	11	306	609	0	27th
28	O. C. Macpherson	White Leghorns (Amer.)......	48	96	8	312	622	7	24th
29	H. H. Bright....	Black Leghorns (1 dead)......	14	25	14	289	532	13	35th
30	H. H. Bright....	White Leghorns (Eng.).......	20	41	10	254	511	9	36th
31	C. H. v. Breda...	White Leghorns (Amer.)......	14	29	1	437	819	3	9th
32	S. Smith........	Brown Leghorns (3 dead).....	16	35	0	314	586	11	30th
33	F. T. Hobbs.....	Silver Wyandottes...........	17	30	12	169	301	3	51st
34	A. Keppie.......	White Wyandottes...........	45	85	0	377	693	9	17th
35	C. H. v. Breda...	White Leghorns (Aust.).......	36	69	15	613	1100	0	1st
36	S. Smith........	White Leghorns (Danish-Am.).	8	16	13	427	805	4	11th
37	F. T. Hobbs.....	Silver Wyandottes...........	20	37	4	258	466	10	43rd
38	Vacant.........	—	—	—		—	—		—
39	C. H. v. Breda...	White Leghorns (Aust.-Amer.).	25	49	11	535	988	6	4th
40	R. J. Williams...	Black Minorcas (2 dead)......	1	1	14	92	219	9	52nd
41	F. Muller.......	Black Minorcas (1 dead)......	27	56	4	240	490	7	41st
42	C. H. v. Breda...	White Leghorns (Amer.)......	22	48	5	292	636	11	22nd
43	I. E. Wright.....	Brown Leghorns (2 dead) (Pen withdrawn)	—	—		—	—		—
44	C. H. v. Breda...	White Leghorns (Amer.-Aust.) (1 dead)	27	56	11	448	870	11	7th
45	B. Kauffmann...	White Leghorns (Eng.)........	28	54	14	295	581	15	31st
46	S. A. West......	Brown Leghorns.............	28	55	11	319	623	12	23rd
47	R. W. Hazell....	Black Orpingtons...........	Nil	—		227	443	7	45th
48	C. W. Pilkington.	Rhode Island Reds...........	20	47	3	231	508	9	37th
49	S. Smith........	Brown Leghorns (2 dead).....	2	4	7	215	396	6	46th
50	C. H. v. Breda...	White Leghorns (Aust.-Amer.) (1 dead)	31	59	6	491	875	7	6th
51	K. B. Jobling....	White Leghorns (Aust.-Amer.) (1 dead)	20	43	1	301	592	14	28th
52	S. A. West......	Brown Leghorns (1 dead).....	15	30	3	253	493	5	40th
53	N. Cole.........	Brown Leghorns.............	34	71	6	377	745	5	14th
54	K. B. Jobling....	White Leghorns (Amer.) (1 dead)	51	105	4	350	689	9	19th

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

STOCK SALES IN SOUTH AFRICA.

To the EDITOR of the *Agricultural Journal*.

SIR,—Will you kindly allow me space to make a few remarks about the way in which stud stock—and more especially stud sheep—are bought and sold in South Africa.

Let me say, right at the start, that I consider it high time that we in this country followed the example of Australia and had recognized centres where stud stock were put up for auction every year. In Australia public opinion—backed by solid cash—places the value upon animals of different types from the various stations, and it is very interesting to note the way in which some breeders, by producing the most popular types and by careful attention to condition and "get-up" of their sheep, climb to fame; and how others, again, through want of knowledge and carelessness, lose their reputation.

I do not for a moment mean to say that all the stud sheep in Australia and Tasmania are bought or sold at the annual stud stock sales—very far from it—but I do mean to say that the big annual sales—where great numbers of stud sheep of every breed and type and style are brought together for inspection first and sale afterwards, before a great congregation of sheep-men from Australia, Tasmania, and South Africa, and from all parts of the world where sheep are kept—to a very great extent put a basis of value on every class and style of sheep offered, and the values placed upon the different classes at those sales are greatly used as a basis for buying and selling values for the whole year.

In South Africa the great majority of stud sheep are bought privately either at the shows or at the homes of the stud breeders, and in many cases the sale price is fixed not so much on the true market value of the sheep but in proportion to the readiness with which they are being sold and on the keenness or buying capacity—and, I am afraid, in some few cases the gullibility—of the purchaser. That some breeders who charge big prices for their stud sheep give good value for the money I am perfectly ready to admit. I will go further and say that some breeders sell their stud sheep, or at any rate some of them, at prices which would be doubled and even trebled if they were submitted by public auction to the best of public opinion.

I feel confident, Mr. Editor, that, if well-represented annual stud stock sales were held, stud sheep throughout South Africa would be bought and sold on a basis far more in accordance with their true value than they are to-day.

Just one other point: If sales such as I have described were held, they would indicate if public opinion, backed again by hard cash, upheld the opinion of our judges at the shows.

I believe that Messrs. Whiley, Roderick & Co., of Bloemfontein, have started to hold stud stock sales. As Bloemfontein is a central place and a start has been made, would it not be a comparatively easy matter to organize representative annual sales of stud stock that would in time entice buyers and sellers from all parts of South Africa to meet there?
—Yours, etc.,

Kokstad, East Griqualand. P. G. LEONARD.

THE SECRETARY BIRD AND GAME PROTECTION.

To the EDITOR of the *Agricultural Journal*.

SIR,—Referring to Mr. H. N. Devitt's article in your March issue, on game protection, in which he expresses some doubt as to the Secretary Bird being guilty of destroying young game, it may interest him to know that, about the year 1894, between Klerksdorp and Buffelsdoorn I saw a Secretary Bird running away with a three-parts-grown hare in its beak. I was travelling in a spring wagon with some eight or ten other members of a football team; the bird was only about 40 yards away and the hare could be easily seen at that distance, and appeared to be dead. Of course, it is possible that the hare may not have been killed by the bird, but so far as could be seen it had not been partially eaten, as you would think would have been the case if it had been killed by ground vermin of any sort. The circumstances looked suspiciously as if the Secretary Bird was guilty, and I have ever since looked upon them as rank poachers.—Yours, etc.,

P.O. Box 1096, Johannesburg. E. H. RULMAN.

BEE-KEEPERS' EXAMINATIONS.

To the EDITOR of the *Agricultural Journal.*

SIR,—The *Journal* for March, just to hand, contains a note on the above, and with reference thereto I should like, with your kind indulgence, to say that it appears strange that the bee-keepers of the Cape Province have hybernated so long and allowed the New Capital to score another win against them. Personally, I can do little but clamour and make a stir to try and awaken an interest in the commercial side of agriculture, which the expert can show to be a line which gives as big a return for labour and outlay as any on the farm. I have many times drawn the attention of readers of the *Cape Agricultural Journal* to the matter, and again I appeal to the bee-man to organize as our neighbour has done. and give us the opportunity of putting up for the examinations. To those in the business it will be great help; to those who handle and use honey it will be still more useful. Could not a branch of the Pretoria Association be started at this end of the Union? In my own vicinity the number of hives is at least three hundred, and in this Province there must be as many thousands; and as many again of all sorts of boxes used as hives. Such an association would have plenty of ground to work on. Could not Mr. Gordon Samson or some other prominent bee-man move in the matter in Capetown; the country members could be enrolled easily by notice in your *Journal.* Should this meet the eye of any interested capable bee-man, I will, in my own sphere, help to make a beginning.—Yours, etc.,

Cape Province. ICHNEUMON.

POISONING JACKALS AND CATS.

To the EDITOR of the *Agricultural Journal.*

DEAR SIR,—I have often read articles in the *Cape Agricultural Journal* on the distributing of poison for jackals. Such articles are always read attentively by myself and every enemy of jackals, on account of the war which one has continually to wage against jackals and which is the more difficult through neighbours seldom or never placing any poison. As it may be of some benefit to stock farmers, I shall briefly describe my way of distributing poison (although changes are not always for the better).

I use strychnine which can be obtained at our magisterial offices. Generally, I prepare small pieces of body or kidney fat, as jackals are fonder of fat than of meat. I take from ten to twenty pieces of fat, the size of a dove's egg, for the more pieces you take and the greater the area over which they are placed, the better it is. The poison is obtainable so cheaply at our magisterial offices, that the cost is amply compensated for, even should only one jackal be killed. I generally distribute the poison but once, not always having time to go over the same ground. I do not make a trail with a piece of carrion or intestines, although such a trail is also to be recommended; but I take a bucket with the contents of the bowels, mixed with pieces of the intestines, the smell of the bowels being stronger and more lasting. And, further, I wet the pieces of poison a little with the contents of the bowels, in order to remove the smell from the hands, and also for this reason, that a jackal. on tasting the bitter poison, may think that it is the bitterness of the dung. I then bury small quantities (about 1 lb.) of the dung partly under the ground at places which stock and jackals frequent, in the same manner as a cat or other vermin would do. In this way the dung retains its odour longer and does not dry out so soon. On this dung I put the poison. It is better to hide part of the contents of the bowels by a small bush and drop a little of the dung in the bush. If a jackal comes near to it, he becomes curious and confident and sniffs about in the bush for more, under the impression that one of its comrades has been eating there, and is consequently less suspicious.

With this method of placing poison I have been very successful and have found dead jackals not far from the place where the poison had been put, they having died at different times; from which it appears that the poison can be traced and found by jackals a long time after it has been placed.

Cats.—I do not know how far wild cats are distributed over our country and what damage they do; but along the Orange River cats are sometimes a plague amongst lambs and as cunning as a jackal. Cats are very fond of catching their food, and consequently do not go by the smell so much as a jackal; they therefore seldom pick up poison, especially if they know where to find or catch something. My experience is that the poison should not be put at random in any part of the carrion. As far as I know, the best thing to do, upon finding carrion, is to just leave it as it is and then put the poison in the part where the cat has eaten the last time, or else put the poison where the carrion is still wet. Cats always start feeding again at the same place where they have left off. In this manner the cat eats the poison unknowingly with an empty stomach.

I would prepare poison in the same way for a tiger, its habits being similar in many ways to those of a cat.—Yours, etc.,

Post Bag, Wilgenhoutsdrift, via Upington. J. STEENKAMP.

BEE PIRATES.

To the EDITOR of the *Agricultural Journal*.

SIR,—I notice the bee-pirate pest is discussed in the March number of the *Journal*, and for the benefit of those interested I send the result of observations made by me recently at Rondebosch, where both the yellow bee-pirate and the banded bee-pirate abound in large numbers. Of the two pirates I am inclined to think the yellow (*Philanthus diadema*) does the greater amount of damage as it is very much more common than the banded pirate. I have never observed the yellow pirate attacking bees entering and leaving the hive, although I have frequently seen small specimens (presumably males) sitting about on bushes in the neighbourhood of my hive. The yellow pirate catches his prey at the flowers, and during the warm hours of a summer day may be seen in dozens and scores haunting the red flowering gums and the honey-bearing plants when in flower. But the pirate is not to be caught while out hunting; the only sure way is to find her burrow. I have never found more than two pirates in the same burrow, but usually a large number of burrows are found in the same locality. The burrows are made in the sloping side of a ditch or a bank and are easily found by the neat heaps of loose sand piled at the entrance of each hole. Having located the habitat of the pirates they should be destroyed by means of a mixture of paraffin and water in the proportions of about one to two, well shaken up together. This mixture should be poured into the holes, and the best time to do this is a little before sundown, just before the pirates close up their burrows for the night. At this time of the day the yellow pirates may be seen returning home, each one bearing a hapless bee.

A little of the mixture poured in at the mouth of the burrow usually results in the occupants crawling out to lie down and die at the entrance. If the pirate flies off after being wetted it is a sign that the mixture is too weak in paraffin. In this way I have destroyed several colonies of these yellow pirates during the months of January and February last.

The banded pirate is a different proposition. In spite of a careful lookout I have not yet succeeded in finding the lair of a single one of these terrible fellows, although I have often looked on helplessly watching them hunting my bees at the hives mouth and bearing them off in triumph. The bees have no chance when the pirates are about, as these settle upon the alighting board and either the incoming or the outgoing bee is grist for their mill and is promptly seized while on the wing and carried off. The pirate can often be struck down by a stout short stick or a tennis-racket just after he has caught his victim, as he flies rather heavily with his burden, but this process is a slow one and the bee-keeper cannot spend his days standing about the hives. I have tried fly-paper placed along the alighting board, but the sturdy pirate drags himself out of this unless the bee-keeper is there to crush him when he settles. It is possible that bird-lime of the right consistency could be made to catch the pirates and I intend making experiments in this direction next season.

There is very little risk of catching an appreciable number of bees in the trap if the alighting board is fairly wide and if care be taken to place the bird-lime on a narrow piece of loose wood placed along the outside edge of the alighting board.

I have tried paraffin and water placed in saucers near the hive and caught in this way a small proportion of those that visited the hive.—Yours, etc.,

D'URBAN GODLONTON.

Capetown.

To the EDITOR of the *Agricultural Journal*.

SIR,—In the March *Agricultural Journal* inquiries are made about bee-pirates. We should like to state our experiences as regards this pest. A white plate with blue edge is used, and filled three parts with water, the remainder with paraffin. It is then placed on a level piece of ground directly in front of the hive (the latter is raised 12 inches from the surface), the front being cleared of weeds, etc. The pirates are mostly on the wing, darting after the bees as they leave and enter the hive. When tiring, they swoop down and skim the surface of the water, no doubt to drink, but owing to the paraffin they meet a sudden death. It is a great success. Clear out the plate each evening of dead pirates, as the water will last for about three days before requiring renewing.

From 16th to 30th January we caught in front of one hive eighty-seven pirates, fourteen bees, besides moths, flies, etc. For the first three days the toll of bees was six, four, and two; for the remainder of the month, two. So the bee seems to get used to the plate and does not touch it.

The bad season for pirates here comprises the months of January and February, especially warm and calm days.—Yours, etc.,

CAIRNCROSS BROS.

Elsie River Halt, Cape Province.

THE CAUSE OF SORE TEATS.

To the EDITOR of the *Agricultural Journal.*

SIR,—With reference to the correspondence of Mr. A. Thompson on sore teats, I wish to state their cause briefly. Any intelligent person will be able to understand it. It is as follows:—

When milking incessantly without wetting the teats, these burn under the fingers of the milker and small cracks are the result on account of their being dry, and consequently the teats become sore. It is therefore evident that the milker is the cause and not the calf.

My advice for sore teats is simple and efficient. Take the cream of old milk, either separator or other cream—put some of it on the sores and they will cure. Mr. Thompson can try it by milking a cow a few weeks dry, i.e. without wetting the teats, and again by occasionally wetting the teats whilst milking. The result will admittedly be favourable.

Hoping that this simple remedy may be of some use.—Yours, etc.,

Goree, Ashton Station. J. J. VAN DER MERWE.

FRUIT PASTE.

To the EDITOR of the *Agricultural Journal.*

SIR,—With reference to the note on page 5 of the *Journal re* fruit paste, I would like to mention that this is no new discovery as it has been made in the Robertson and Keerom Districts for at least the past seventy years. In fact, I believe the French Huguenots were the ones to introduce this method of drying fruit. Very ripe fruit is used and is washed to a fine pulp; it is then rolled out like pastry and placed on boards which have been rubbed over with fat. The boards with the paste are placed in the sun until dry. It is then rolled up like ordinary jam roll. I do not think there is much chance of people who have made this paste for more than fifty years giving up doing so now because Mrs. van den Bosch has taken out a trade mark for it.—Yours, etc.,

Brackenfel Siding, Cape Province. F. D. BAILEY.

TO ERADICATE RATS AND MICE.

To the EDITOR of the *Agricultural Journal.*

SIR,—Rats and mice are a pest almost everywhere, and although traps of all kinds, etc., have been invented and used in large numbers, and thousands of the little animals are destroyed every year, still the pest seems to be on the increase. Not alone do they destroy almost everything they come in contact with, but are credited with conveying bubonic plague, cholera, and fevers of various kinds, and I should not be surprised if sleeping-sickness were also carried by them.

We always have a great many here, mice especially, but this season they have been quite a pest. For some six months I caught on an average four a day, and some days have got as many as eight to twelve, all caught with those flat traps with a wire loop and a strong spiral spring. These traps are splendid, for if they but get hold of the mouse by the tail or foot you have him. Mice and rats, however, are very sly; it is of no use baiting the trap: a better plan is to stand a piece of board up against the wall so that there is a space of 2 to 3 inches, forming a tunnel, or place a box so that there is a narrow space 2 to 3 inches wide, and place the set trap at the further end, and the first time Mr. Mouse comes around he is sure to run behind the board or box and you have him. When they fight shy of that place, just repeat the operation elsewhere.

But this season, for all I could catch, they did not decrease, but the reverse. They tore up my books and papers, tore labels off canned fruit and other bottles, etc., made holes in the cloths placed over the milk dishes, and ate the cream. They would leave nothing alone, so in desperation I thought I would try and poison them, but was afraid they would crawl into their holes and under the floors and die there. Then I bethought me of my old friend for treating scab, Cooper's Dipping Powder, and made my bait thus:—One teaspoonful smoothed off flat of Cooper's powder; three large tablespoonfuls of nice rich gravy having a little fat in it; two slices of bread, say 6 inches by 4 inches by half an inch thick. I mixed the powder and gravy thoroughly and spread it on both sides of the bread, then cut the latter into squares and placed these in the cellar and office, in places behind boxes, etc., where they would not be swept up. The result has been marvellous; we had been completely overrun with mice, etc., and within the first week we hardly saw one, have had traps set for a fortnight without catching any. It is now a month since I laid the poison, and although some 100 yards or so from our house the pest is still bad, we are practically free. I do not know whether they die and are eaten up by the other—for they eat those caught in a trap if left for a couple of days—or whether they have taken fright and cleared away. I believe if Cooper's Dipping Powder was applied in this way in the large stores in Port Elizabeth and other towns, they would very soon reduce the number of those large filthy rats which are so destructive. I hope it will be tried, as it is a very cheap and effective remedy.—Yours, etc.,

Aberdeen, Cape Province. FRANCIS C. W. EAGLE.

LIME-WATER FOR BLOAT OR OPBLAAS.

To the EDITOR of the *Agricultural Journal.*

SIR,—It oftens happens, in feeding animals on fresh green lucerne, that, with the gas resulting from fermentation in the stomach, they get blown up. My brother here informs me of a simple method of expelling the gas, viz., by giving the animal affected lime-water. This can be prepared by putting the required quantity of lime into a bottle and filling same with water. After shaking the contents of the bottle, pour off the water, after allowing the lime sediment to settle, and give the animal in the usual way. My brother, who gives lucerne to his animals to a very considerable extent, always uses the remedy above indicated; he states it acts immediately and like magic, the gas being expelled through the throat and mouth, at times producing a whistling sound in its forceful and hasty passage.

I pass this on to you in case this remedy has not yet been published, in the hope that it may prove useful to some of our farmer friends.—Yours, etc.,

H. ROSE-INNES.

Salt River Farm, P.O. Nelspoort.

POULTRY HOUSES.

To the EDITOR of the *Agricultural Journal.*

SIR,—I read with interest the article in the *Agricultural Journal* on poultry houses, by R. Bourlay. Most of it is old ground, but I concur in all his examples and remarks except a few which you will pardon me if I take exception to. For instance, ventilation is all very well, but figures 1 and 4 are overdoing it and would not do at all in some localities. Apart from the danger of thieves, if strong wind gets under those roofs they are bound to be wrenched off or topple over. And what prevents the fowls themselves from flying out at any time? From 150 to 200 fowls pass through my hands every week and are housed every night, but would fly out at once if the fowl houses were built on the type of those illustrations. The top should at least be fenced in by wire netting.

Then a much simpler thing than "ordinary 3-inch × 2-inch scantling" for perches is bamboo and reeds (spaanseriet), which cannot be excelled for the very good reason that they are strong, light, and easily obtained. Fixed together with bits of wire these can stand any strain. There is no danger of splints, and the surface being so smooth and clean fowl ticks have no chance to hide.

As to these last, my experience is that if you spray or dash in all parts of your fowl house water strongly mixed with dip (I use McDougal's) and with a feather or wedge smear all the interstices with same, it will go hard with these pests. But continual care is necessary.

The above experience may perhaps be useful to those who want a simple effective perch for their fowls with very little expenditure.—Yours, etc.,

A. SCHOCH.

Halfmanshof, Porterville Road, Cape Province.

WIRE-WORM IN SHEEP.

To the EDITOR of the *Agricultural Journal.*

SIR,—With regard to the enormous losses caused by the wire-worm (haarworm) in sheep stock, the following might be worth considering.

In the south-western parts of Swaziland there is a tree growing, called by the Kaffirs "Sebaga" or "Sebago" (the "g" to be pronounced after the Dutch fashion).

The brownish bark of this tree is ground to a powder, and used with good effect against "paapjes" (worm or larva in bowels of horses), and even against disordered stomach of men. It has a sharp taste like cayenne pepper.

I remember, when surveying in these parts, an old farmer, one of the old hunters, giving a teaspoonful in milk of the powder to a horse which had gone rather far already with paapjes; after the dose had been given, the worms could be seen crowding the excrements, and the horse grew all right again.

The bark is known well with farmers and Kaffirs in those parts, and it should be easy to get a sufficient quantity for experimenting with the assistance, say, of the Native Commissioner or Officer Commanding Police at Hlatikulu or Piet Retief.

Not being certain to whom to address this letter, I thought it best to write to you, and ask you to be kind enough, if I am wrong in this, to communicate with the proper address, perhaps Dr. Theiler.—Yours, etc.,

C. A. RÜHS, Government Land Surveyor.

P.O. Box 28, Pietersburg.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*. In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

STIFF-SICKNESS.

Mr. Geo. Gawl, Faber's Kraal, Highlands, C.P., forwards specimen of a plant growing in large quantities in his district (Albany), and asks if this is identical with the one illustrated in the February issue of the *Journal* as the plant causing stiff-sickness and lamziekte in the Transvaal.

Answer.—The following reply was posted :—The plant sent is not *Crotalaria burkeana*. It is a species of *Indigofera* which is not known to us as being poisonous, although it is quite possible that it would produce injurious effects if eaten in quantity.—GOVERNMENT AGROSTOLOGIST AND BOTANIST.

OPTHALMIA IN CATTLE.

Mr. H. C. Pettit, Mimosa (C.P.), asks for advice in regard to treatment of an eye trouble among his dairy cows. A small white spot develops in the centre of the eye, and within two days the white area spreads and covers the whole surface of the eye.

Answer.—The following reply was posted :—The trouble is evidently specific opthalmia, a contagious form of inflammation of the structure of the eye. The white spot that remains is a cataract, namely, opacity of the whole or part of the lens, and is most difficult to treat, the results not being very satisfactory. As the disease is of a contagious nature, the first step in treatment is to isolate the affected animal. As light irritates the inflamed eye, the animal should either be placed in a clean, well-ventilated, darkened stable, or have a shade put over the affected eye or eyes. This can be done by putting an ordinary halter on the animal, and fixing a piece of cloth or calico to it in such a way that it covers one or both eyes, as required. In the early stages, good results are obtained by blowing calomel into the eye two or three times a day. Later the eye should be syringed out two or three times a day with a nitrate of silver solution, strength 5 grains to the ounce of water. Get a chemist to make up the solution and use a glass syringe.—VETERINARY DIVISION (Transvaal).

A SELF-SUCKING COW.

Mr. R. G. Rawlinson, P.O. Box 126, Boksburg, wants a cure for a very determined self-sucking cow. He says: I have a cow about six years old and a fairly heavy milker, and have tried the following remedies without any lasting success, and sooner or later she finds a way of getting at herself; (1) I first tried a halter with spikes, which was quite useless; (2) A pla k in the nose, which answered for about a week; (3) I lashed a stick across the forehead under the horns, which answered a few days; (4) I put her nose in a bag every night, which was successful until she started to suck herself while out grazing; (5) I fixed two light hurdles each side of her neck, strapped top and bottom, and was successful for some four months, and now is quite useless; (6) I tried covering the udder with canvas attached to a girth around her belly and over the hips and brought between her legs and fixed over her tail, which she pulled off with her teeth; (7) I bored two holes in the tips of her horns and attached ropes to same and fixed to a girth around her shoulders, which answered for one day, getting the one rope over her back and sucking herself. My only plan now is to apply a charge of shot while in the act of sucking herself, unless someone can suggest a more humane remedy.

Answer.—The following reply was posted :—You have certainly tried about all the known ways to prevent the cow sucking herself. A cradle or, as you term them, hurdles properly fixed on the neck should act as a preventive. Why not get a Veterinary Surgeon to perform tracheotomy and see what effect that will have.—VETERINARY DIVISION (Transvaal).

SICKNESS IN COW AND DOG.

Mr. W. S. Warner, P.O. Ryno, via Indwe, Cape Province, states that about two months ago a cow of his seemed to be stiff in all four legs. The stiffness continued, so that the animal walks with difficulty; it feeds well, nevertheless. He has also a valuable terrier which suddenly went lame in one front and one hind leg. It then seemed to lose the use of hind legs, but after about a week it recovered, and now every few days it gets bad again. The attacks come on very suddenly. He asks for information as to the cause of the trouble in each of these cases.

Answer.—The following reply was posted:—I am inclined to think that the cow may be suffering from so-called stiff-sickness, a disease dealt with at considerable length in the first number of the *Union Agricultural Journal*, to which I would refer you for further information. As regards the dog, the case may be one of rheumatism, and I would suggest that you try the administration of tincture of colchicum in doses of, say, ten drops, three or four times a day in a little water.—VETERINARY DIVISION (Cape).

BRAIN AND SPINAL AFFECTIONS IN HORSE.

Mr. I. J. Theron, Wonderboom, Deelfontein Station, Cape Province, writes:—I kept a young horse stabled during the dry season. Some days ago I brought it on the veld. That same night a cold rain occurred and it got wet. A few days afterwards I found it to be completely lame. I tried to raise it, but it had great difficulty in standing on its legs, and is still in the same condition. However, it feeds well, and nothing seems to be wrong, except that it seems "drunk". Please let me know what is the reason of this condition and what remedy I must apply.

Answer.—The following reply was posted:—From the history and symptoms described it is difficult to say exactly what is the matter with your horse. The partial paralysis and turning round would appear to point to both brain and spinal affections. I would suggest you keep the horse in a good big, loose box, put a rug or two on him, bandage his legs at night, and give him in moderation good easily-digested food, such as steamed oats, bran, crushed mealies, carrots, green barley, lucerne, etc. If he is inclined to lie down a lot, a good bed should be kept under him, otherwise he may get sores on his body.—VETERINARY DIVISION (Transvaal).

HORSE WITH STRAINED LOINS, ETC.

Mr. E. Cyril C. Glass, Craigton, Estcourt, Natal, writes:—Will you please advise me as to how to treat a horse recovering from strain across the loins and hind quarters generally. The horse seems to be in perfect bodily health and can now stand and walk about, though rather stiff and shaky. The injury is three weeks old, and was caused through backslipping when jumping a donga. The horse stands 14.2 and is between eight and nine years.

Answer.—The following reply was posted:—In the first place it would be wise to give the horse a fortnight's or three weeks' rest. He should be kept in a loose box or roomy stall. Have a liniment made up of 1 ounce each of liquor ammonia fort and turpentine and 12 ounces of olive oil. Rub a little into the strained part twice a day for one minute each time—VETERINARY DIVISION (Transvaal).

EVERSION OF THE RECTUM IN OSTRICHES.

Mr. N. W. Fitzhenry, Hareflats, P.O. Aberdeen, Cape Province, asks:—Can you tell me what is the cause of the lining of the rectum of a number of my ostrich chicks coming out when they excrete?—Also what I must do to remedy and prevent same? The chicks get this trouble from about six weeks old; the lining comes out and stays out for a very long time. The birds are running on lucerne. I have already lost a number. I would like to add that the birds make a peculiar croupy sound in their throats.

Answer.—The following reply was posted:—The condition of the rectum described is not at all uncommon in ostriches on lucerne. It commences, as a rule, when the feeding is dry, and the birds consequently become constipated, the foeces being retained, the mucous membrane of the rectum becomes inflamed and thickened from irritation produced by the large amount of phosphatic salts contained in the excreta. When defaecation takes place some amount of straining occurs, the lining membrane of the rectum is everted and if the condition continues it ultimately cannot be returned. The treatment when a case is first noticed is to give the bird laxative food and it is also advisable to lubricate the rectum with oil or fatty material; this relieves the irritation and also facilitates the passage of foeces. When the condition becomes chronic, the best treatment is to dress the everted membrane every two or three days with an astringent, and for this purpose a solution of bluestone (sulphate of copper), half an ounce to a pint of water has been found useful. Eversion of the rectum is sometimes due to the presence of parasites in the digestive system, and as a preventive the general conditions in which the birds are kept should receive attention.—LECTURER IN VETERINARY SCIENCE, GROOTFONTEIN SCHOOL OF AGRICULTURE.

DIPPING TANKS FOR OSTRICHES.

Mr. M. Rudman, Sand Kraal West, P.O. Miller Station, asks for particulars regarding the construction of dipping tanks for ostriches.

Answer.—The following reply was posted :—An apparatus for ostrich dipping was described in the *Cape Agricultural Journal* of March, 1909 (Volume XXXIV, No. 3). A copy of the *Journal* can be obtained on application to the Under Secretary for Agriculture, Capetown. The makers of the apparatus in question were Messrs. Cunningham and Gearing, of Capetown, the plans being drafted by Mr. Ernest Edmeades, of Welbedacht, Oudtshoorn.—EDITOR, *Agricultural Journal.*

ENSILAGE MAKING.

Mr. R. H. Cass, Rooikoppies, P.O. Raytor, Transvaal, asks whether, in preparing ensilage, salting is necessary, and how the temperature of ensilage may be controlled ?

Answer.—The following reply was posted :—(1) *Use of Salt.*—Some people recommend salt, but others strongly advise that salt should not be used. Good silage is being made in the Transvaal without the use of salt, and I therefore think it preferable to give the salt to your stock instead of with the silage. Furthermore, it is possible that the salt might check the process of fermentation which is so necessary for the preparation of good silage. (2) *Temperature.*—Ordinary farm experience soon teaches one how to determine the temperature without necessarily using the thermometer. But in order to gain experience it is well to make use of the thermometer and this instrument is always useful on a farm. You can hang the thermometer in a hole left on a stack or pit, and covered with something to prevent the cooling of the air in the hole. Some farmers use a rod of wood or iron which is kept thrust into the stack or pit and the heat of which to the hand when the rod is pulled out indicates sufficiently closely the degrees of temperature reached, but, as I said before, you have to learn by experience when the rod has reached the right temperature. This could be tested perhaps in an oven, but even then it would be necessary to use a thermometer, and if you are going to use one you might as well use it in the stack or pit. To reduce temperature when it has reached a desirable maximum, add more silage, or if you have already got all that you require or that your sill will contain, add a covering of grass and earth or stones. The object of this covering is to prevent the access of fresh air which stimulates fermentation.—GOVERNMENT AGROSTOLOGIST AND BOTANIST.

LUCERNE CULTIVATION.

Mr. Llewellyn Curlewis, "Fonteintje", Colesberg District, inquires: (1) Which is the best—planting lucerne in beds, or drawing furrows ? (2) If the former, how long should the beds be, how broad, what should be the height of the bed walls ? If the latter, what distance should the furrows be apart ? Should they run parallel ? (3) Can you recommend any particular lucerne seed ? (4) Which is the best method for sowing lucerne seed—flooding the ground before sowing, or after sowing ? (5) Which is the best method for covering in the seed—a light harrow or a rake ? If the former, to what depth, about, should the seed be covered, or rather how deep should the seed lie under the ground ?

Answer.—The following reply was posted :—(1) It is far better to plant lucerne in beds than by dividing the land up with furrows. (2) The length and breadth of the beds depends on the strength of your water and the nature of your soil. If you have vast quantities of flood water and your soil is very porous like some of our alluvial deposits then you can make the beds about 40 feet wide and up to 500 yards long. If the water is weak you would never get it over beds of this description. Again, if the soil should have a hard pan below, a heavy flooding like that described above would drown out your lucerne. On ordinary, red Karroo soil we find that beds about 20 feet wide and 300 yards long are best. (3) The dividing banks should be about 18 inches high, and at least 2 feet 6 inches wide at the base ; 3 feet wide at the base is better, as these banks are apt to subside and disappear after a turn of years if not constructed very substantially. It is not always convenient to make the banks parallel except on level land if hillside land is being used ; then the banks should be run according to the contours of the land so as to give the beds the desired amount of fall. This will make the beds wider in some parts than in others, but the same amount of fall is maintained throughout. (4) Provence lucerne seed has given us splendid results all over the Cape Province, but the Arabian seed gives the greater growth though of a coarser nature, and is the only variety of seed which is perfectly free of weed seeds. (5) It is better to flood land before sowing than after, as the lands contains its moisture for a greater length of time owing to the cultivation after flooding. (6). If hot dry winds prevail it is best to roll the seed in as this brings the moisture to the surface and allows of the seed germinating. At the same time, the land dries out sooner. If there is an abundance of moisture then it is better to harrow in the seed with a chain harrow. Lucerne seed should be barely covered, and an ordinary zig-zag harrow as a rule covers a great deal of the seed too deeply to admit of it ever reaching the surface.—GOVERNMENT AGRICULTURIST (Cape).

NURSE CROP FOR LUCERNE.

Mr. Douglas A. Fraser, Wepener, Orange Free State, has a field which he wishes to sow with lucerne. He proposes to plough it twice, and to sow lucerne together with a crop of winter forage, about September, in the hope of reaping a crop of forage and that the lucerne will then come up strongly in the spring, the forage giving it some protection. He asks whether this plan is feasible. People in his parts appear to sow their lucerne in February.

Answer.—The following reply was posted :—The practice of sowing lucerne with a nurse crop of oats is not uncommon in this country, and some maintain that the young lucerne gains slightly by the protection afforded by the growing oats. On the other hand, the lucerne never makes much headway till the oats have been taken off and the ground is often very dirty afterwards. It is not really an advisable practice, as lucerne demands all the moisture it can get, while oats are also greedy for water. Barley is better in this sense than oats, as the former crop is more of a surface feeder. The plan is quite feasible therefore, but is best left alone. Lucerne gives best results when sown by itself.—EDITOR, *Agricultural Journal.*

CANGO MAIZE.

Mr. Robert Reid, P.O. Box 35, Volksrust, writes :—In Mr. Burtt-Davy's article on Maize Judging in the March *Journal*, I notice that the number of rows on White and Yellow Cango cobs is given as twelve in each case. I shall be very much obliged to hear from Mr. Burtt-Davy as to whether that is the right number. I am uncertain as regards Yellow Cango, but most of the farmers here select eight-row cobs of White Cango for seed.

Answer.—The following reply was posted :—The number of rows is not definitely fixed in Cango, as no steady selection has been made towards this end. It is desirable, however, that it should be fixed and you would do well to begin this year. The eight-row type produces a large grain, but one that is rather too large to suit European buyers. The true Cango grain is smaller and better suited to the purposes for which the flints are generally used. To obtain a small grain, it is desirable to develop more than eight rows on the ear; this also means a better yield. For Cango twelve or fourteen is a desirable number of rows. The eight-row type is really a distinct breed which is largely grown in the Eastern Province, but it is now so much crossed with the other that it may take some time to segregate them again.—GOVERNMENT AGROSTOLOGIST AND BOTANIST.

PRESERVING MANGOLDS FOR WINTER FEEDING.

Mr. J. F. Pentz, of Vryburg, has a field of mangolds which are growing so tall and heavy that they fall over, and he would like to know how they might be preserved for winter feeding.

Answer.—The following reply was posted :—Mangolds can be successfully stored by stacking them in pits. The mangolds should be ripe before they are lifted, then taken to a pit in some dry piece of land and stacked much the same as we would stack wheat, all sloping outwards. When the stock is finished it should be covered with grass or straw and then covered with about a foot of earth all round, not less. Before stacking the mangolds it is as well to allow them to wilt after lifting them, as they are not then so easily bruised and are nice and dry when packed into the stock.—GOVERNMENT AGRICULTURIST (Cape).

THRESHING TEFF-GRASS.

A correspondent at Heidelberg, Transvaal, states he has about 15 tons of fully matured teff-grass on his farm, which he is desirous of threshing for seed, and asks for information as to the best method of threshing and of obtaining clean seed.

Answer.—The following reply was posted :—Teff-grass can be easily threshed with an ordinary hand thresher such as is used in many parts of the Cape Province for lucerne seed, and then cleaned by means of a winnower used for similar purpose with very fine sieves. These winnowers are obtainable from Messrs. Mangold Bros., Port Elizabeth, and are called T. Corbett's Patent " Eclipse ".—GOVERNMENT AGRICULTURIST (Cape).

DRYING CHICORY ROOT.

Mr. Chas. R. Tee, P.O. Gedultz River, via Port Elizabeth, Cape Province, asks for particulars of the best method of drying chicory root, and also for a recommendation in regard to seed.

Answer.—The following reply was posted :—Wit Loof chicory is considered one of the best varieties. As a rule, we have not been successful with drying chicory in this country in the usual way of putting it out in the sun after cutting it up. It is far better to use ovens, either iron or masonry, for drying chicory in, after which it can be sent direct to the factory for roasting and grinding.—GOVERNMENT AGRICULTURIST.

TOBACCO CULTIVATION.

I am writing to ask your advice on certain points in connection with tobacco cultivation. The kind I want to go in for is the ordinary Kaffir tobacco, which the natives use down in these parts. When is the best time to put the seed in ? What kind of soil is best ? What manure is best ? And where can I get the above seed ?—T. A. TRENNERY, Indwe Poort, Lady Frere, Cape Province.

Answer.—The following reply was posted :—The best time to sow tobacco seed is about the beginning of July. The best soil is an old Kaffir kraal or other rich loamy soil that has been under cultivation. A good manure to use is well-rotted kraal manure or artificial fertilizer, containing, say, 6 per cent. potash, 4 per cent. nitrogen, and 10 per cent. phosphoric acid, all in an available form. This should be applied at the rate of 100 lb. to 1500 square yards of seed bed. Your name has been registered for seed, which will be forwarded when it is ready for distribution ; you will also receive seed of one of the heavy types suitable for Kaffir tobacco.—TOBACCO AND COTTON DIVISION.

BEE PLANTS.

Miss G. Buchanan, Klipkraal, P.O. Trichardts, Bethal District, forwards specimen of a plant and asks if the shrub contains nectar, as it appears to attract bees.

Answer.—The following reply was posted :—The specimen is a composite known as *Berkheya ingrata*. I have not had this weed under sufficiently close observation to be able to say whether it does furnish nectar to the bees which visit it, but it is probable that this is the case, for many allied plants are known to be useful in this respect. I shall be glad to hear the result of your further observation on this plant, for, as it is not common in Pretoria, I have not yet been able to study this point as I should like. In several parts of the Transvaal and Free State, *Berkheya ingrata* appears to be spreading, and some farmers are urging that it should be proclaimed a noxious weed as it is disliked by stock on account of its prickly nature. It does not seem necessary to proclaim it, however, as it can scarcely be considered a noxious weed in the strict sense of the term. If the farmers object to it, I see no reason why they cannot keep it in check without interference by the Government. If you hear any opinion expressed as regards the spread of the weed, perhaps you will be so good as to write me on the subject for I am anxious to collect information bearing on the point.—GOVERNMENT AGROSTOLOGIST AND BOTANIST.

REDWEED (*Striga Lutea*).

Mr. C. D. Harding, Beginsel, P.O. Wolvehoek, forwards for identification specimen of a plant which, he states, kills everything growing within a radius of ten or twelve feet, including mealies and Kaffir corn.

Answer.—The following reply was posted :—The plant is the Redweed or Rooibloem, *Steiga lutra*, a parasite on the roots of maize, Kaffir corn, etc., which is doing much damage to these crops. At present a definite remedy for the pest cannot be given but the subject is under investigation by the Department. In the meantime, it would be a good plan to plough any lands not under crop on which the weed occurs before the weed seeds.—GOVERNMENT AGROSTOLOGIST AND BOTANIST.

UIENTJES GRASS (*Cyperus esculentus*).

In reply to a correspondent who asks for advice as to the best means of getting rid of " uientjes gras ", the Government Agrostologist and Botanist recommends winter fallowing of the land with frequent harrowing during the winter months. This should be followed by a smother crop of teff-grass or manna sown thick.

VITICULTURE AND FLOOD-WATER.

A correspondent at Constantia, Cape Province, states, that he has a farm in the Wellington District, on which he intends to plant a vineyard. The ground chosen becomes flooded in winter three or four times, the water remaining on it for about forty-eight hours. Correspondent has been informed that he need not plant stocks grafted on American vines, as the phylloxera could never live and thrive on ground which is more than twenty-four hours under water, and asks if this is correct.

Answer.—The following reply was posted :—Your information is wrong. In the South of France where certain vineyards are annually put under water to kill the phylloxera the water stands about one foot deep over the whole vineyard *for some six weeks*. So how can you expect such marvels from flood-water acting for only twenty-four to forty-eight hours ? In my opinion, such ground is not the best for a vineyard ; still, if you wish to plant it, take a good American stock like *Aramon rupestris*, Jacquez, or Riparia Gloire, and above all ***drain your ground well*** so as to remove the excess of water as rapidly as possible from the soil after having been flooded.—GOVERNMENT VITICULTURIST (Cape).

POULTRY BREEDS FOR LAYING.

"Inquirer" asks: (*a*) Which is the best breed of fowls for all-round laying, that is both summer and winter? (*b*) which is the best breed of poultry for winter laying exclusively? (*c*) what is the best egg-producing food to feed the fowls on? The fowls have a fair run and are not penned.

Answer.—The following reply was posted:—The best breeds for laying, in both summer and winter, are Wyandottes, Orpingtons, and Plymouth Rocks. These may not produce quite so many eggs as the Leghorn and Ancona, but they lay better during the cold weather. A great deal depends upon the strain; there are good and bad laying strains of all breeds. A variety of foods will give better results than the continual use of any one grain; short heavy oats, hard red wheat, sunflower seed, and an occasional feed of mealies together with plenty of green food should give good results. As a soft feed a mixture of two-thirds bran and one-third mealie meal is very good, but do not feed on soft food more than twice a week as this is liable to make the birds too fat.—POULTRY EXPERT (Transvaal).

MARKETING HONEY.

Mr. Alfred E. Whitney, writes: Can you tell me if a fair contract price is obtainable for honey in the comb at Johannesburg, and who would be prepared to take it? Could you inform me further if there are any special contrivances manufactured for the carriage of honey for long distance journeys? If there are no such contrivances what is the best method of packing same? I hear from various people, that 3s. per section is obtainable but this seems too good to be correct. If 2s. or 1s. 9d. were obtained for all one could supply, it would pay very well, I think.

Answer.—The following reply was posted:—The market price of comb honey varies as other commodities with supply and demand. Present prices (retail) of one pound sections, light comb honey at Johannesburg and Pretoria are from 2s. to 2s. 6d. each. Dark honey 1s. 6d. to 2s. You might communicate with Mr. Quinn, the well-known confectioner, Johannesburg, or Mr. F. Benger, Kempsey Buildings, corner of Fox and Joubert Streets. The two latter would dispose of honey on commission. Messrs. Cairncross & Zillen, Messrs. Amm, and Messrs. Mosenthal & Co., Pretoria, are also wholesale and retail dealers in honey. Comb honey requires very careful packing for transit. The "Cowan" pattern travelling crate with springs is one of the best for the purpose. These crates are made to take twelve or twenty-four 1-lb. sections, and are obtainable from Messrs. Benger or Henwood, Johannesburg, or Cairncross & Zillen, Pretoria. Cost, about 5s. each. If special crates are not adopted each section should be carefully enclosed in strong paper packing and arranged in a light wooden box to take about twenty-four to thirty 1-lb. sections; this box to be enclosed in another stronger box large enough to allow for at least 3 inches of packing on all sides. Grass or wood shavings make good packing material. Hand-holes, rope handles, or wooden cleats must be provided for handling, railway servants not being the most gentle of mortals. Label in large type: "Comb Honey. With great care. This side must be kept up. Package to be kept out of the sun."—H. L. ATTRIDGE.

MANURING OF VINEYARDS.

Mr. J. Retief, Fir Grove, Wellington, Cape Province, writes: I have (*a*) piece of sandy hill soil, several years in succession sown with oats and Government guano; (*b*) vineyard on above soil manured with Government guano and later with Karroo manure; and (*c*) vineyard on low-lying clay on which kraal manure has been used, and now I want your advice as to which kinds of chemical manure would be most beneficial and economical to be applied to (*a*), (*b*), and (*c*) respectively.

Answer.—The Government Viticulturist (Cape) has replied to correspondent as follows:—The following manurial formula I regard as a good one for all the soils mentioned: 500 lb. Government guano; 1500 lb. Karroo sheep manure; 350 lb. basic slag. These weights are meant for one morgen of vines, and are to be given every alternate year, it being understood that all the ingredients are given the same year. The above constituents will cost you about £2. 14s. 6d. You could also have taken: 420 lb. ammonium sulphate (20 per cent.); 180 lb. potassium sulphate (50 per cent.); 880 lb. basic slag (14 per cent.); but this would cost you about £7. 2s. On account of this much higher cost it is simply impossible to make up any formula of the so-called chemical fertilizers that will at all come near the price quoted for the first formula. Our natural and hence-cheapest manures are Government guano, Karroo or sheep manure or its ash, and farmyard manure. The best would be to give alternately farmyard manure, and the first formula quoted above. If "New kraal ash" is used, I recommend per morgen of vines: 600 lb. guano; 600 lb. new kraal ash; 280 lb. basic slag. This would cost about £2. 14s. 6d. The basic slag should preferably be brought into the soil during May, whereas the remaining constituents should follow in June or July. They had best be spread out evenly over the ground and then be immediately ploughed under. Under no circumstances should basic slag be mixed with kraal manure or guano.

POULTRY TROUBLES.

Mrs. Davidson, Twenty-four River Farm, Nylstroom, Transvaal, asks: (1) What should be done for eye-sickness in fowls (when the whole part swells right up and covers the eye)? (2) Is there a mouth disease among fowls (as the back-outside)? (3) When healthy ducks and muscovies get lame in one foot, is it a sign of liver trouble, or the result of an accident? (4) Would you please advise where to get a paraffin spray, for spraying chicken runs for fleas?

Answer.—The following reply was posted:—The eye-sickness which you mention is known as roup and usually commences with a discharge from the nostrils which is accompanied by an offensive smell and sometimes by the appearance of a frothy liquid in the eye. If these symtoms are neglected the disease frequently develops in the way indicated in your letter. At the first indication of the trouble shut the bird up in a warm dry place, bathe the eyes and nostrils every morning and night with warm water containing disinfectant, and give six drops of spirits of camphor in a teaspoonful of water every night and an iron pill every morning. If the eyes swell, gently squeeze out any matter or growth, wash it out well with disinfectant and dust the place well with boracic acid powder. You will probably find that you will have to repeat this operation several times before a cure is effected. There is a very contagious and dangerous disease amongst poultry known as diptheria, but this seems to be very uncommon in South Africa, and the few cases that I have seen have not spread. I think that the case you mention is probably due to the bird being out of condition. Wash the sore with disinfectant and sprinkle it with boracic acid powder and give the bird a small dose of epsom salts. The lameness of your ducks may be due to accident, though that would not account for it if it occurred frequently; it may also be due to liver, but I think that the probable cause is due to corns caused by their walking on hard ground. I was once told by an old duck fancier that when ducks went lame it was a good plan to cut the webbing on the lame foot, but as I have never tried this I cannot vouch for its efficacy. I am sorry that I cannot give you the name of a firm who supplies spray pumps, but should say that you would get a knapsack spray pump such as used for spraying fruit trees from any of the large hardware or implement merchants in Pretoria.—POULTRY EXPERT (Transvaal).

Notes on the Weather, February, 1911.

[CAPE PROVINCE.]

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

NORMAL mean pressure; unusually warm days and nights, with some exceptionally hot spells; a depth of rainfall considerably below the average; a moderate number of thunderstorms, with some destructive hailstorms; a low percentage of cloud, with about the usual fog-frequency; a marked prevalence of easterly (NE. to SE.) winds, with a few gales; these were the leading features of the weather of February, 1911.

Precipitation on the mean of 330 stations, amounted to only 1·92 inches on six days, being 0·40 inches or 17 per cent. less than usual. This amount was 1·08 inches or 17 per cent. below normal, and 1·08 inches less than the preceding month and 2·21 inches less than in February, 1910. If we include 155 stations in the Orange Free State, the mean for this month is further reduced to 1·83 inches, or 1·20 inches less than last month. From the accompanying table it will be seen that an excess over the normals for the various divisions is only met with in the South-west, South Coast, South-east, and Kaffraria, the surplus amounts varying between 37 per cent. over the South Coast and 10 per cent. over the South-east. Over the rest of the divisions a deficiency of rainfall was experienced most commonly of 25 to 40 per cent., but ranging from 4 per cent. over the North-east to 57 per cent. in Bechuanaland. Compared with last month the mean divisional rainfall was much less, except over the South-west where there was a slight increase: whilst in comparison with the means for February, 1910, this month's precipitation was only from a half to one-sixth of the amounts then recorded, the only exceptions being the Cape Peninsula and Rhodesia where increased amounts were experienced. Arranging the monthly totals according to the various quantities collected during the month, it is found that of 485 stations, 14 had *nil*, and 81 had 0·01–0·50 inch; *i.e.* about 20 per cent. of these stations suffered from absolute or partial drought; of the others, 62 had 0·51–1·00 inch; 156 had 1·01–2 inches; 87 had 2·01–3 inches; 37 had 3·01–4 inches; 23 had 4·01–5 inches; 16 had 5·01–6 inches; 4 had 6·01–7 inches; and an equal number had 7·01–8 inches; the largest total being 9·15 inches at Evelyn Valley. The four next greatest amounts were 7·55 inches at Qacha's Nek, Basutoland; 7·41 inches at Fort Cunynghame; 7·08 inches at Hopefountain, Rhodesia; and 7·04 inches at Hogsback. In the Orange Free State the largest totals were 5·70 inches at Hartebeestfontein and 5·52 inches at Christofera, both in the District of Harrismith. Summarizing the maximum amounts recorded in 24 hours, it is found that of 323 stations for which details are available, 139 had 0·00–0·50 inch; 95 had 0·51–1·00 inch; 83 had 1·01–2 inches; and 6 had 2·01–3 inches. Of these six stations, the one having the greatest amount in the 24-hour period was Engcobo with 2·42 inches on the 13th, Thaba N'doda being next with 2·30 inches on the 4th. The heaviest falls of short duration were 1·35 inches in 40 minutes at Ida on

Division.	Mean Rainfall (1911).	Mean No. of Days.	Average Rainfall (1891–1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	0·58	4	0·77	3	− 0·19	− 25
South-west	0·64	3	0·48	2	+ 0·16	+ 33
West Coast	0·16	1	0·28	1	− 0·12	− 43
South Coast	2·20	10	1·68	6	+ 0·52	+ 37
Southern Karoo ...	0·42	2	0·71	2	− 0·29	− 41
West Central Karoo	0·48	2	0·96	3	− 0·48	− 50
East Central Karoo	1·20	4	1·57	5	− 0·37	− 24
Northern Karoo ...	1·29	4	1·72	4	0·43	− 25
Northern Border ...	0·50	3	1·83	5	− 1·33	73
South-east	3·09	9	2·80	7	+ 0·29	+ 10
North-east	2·94	8	3·05	8	− 0·11	4
Kaffraria	4·52	11	3·52	9	+ 1·00	+ 28
Basutoland	3·03	9	3·94	10	0·91	− 23
Orange Free State ...	1·66	6	3·02	7	− 1·36	− 45
Durban (Natal) ...			4·50			
Bechuanaland ...	1·80	6	4·23	8	− 2·43	57
Rhodesia	6·10	13	7·97	13	1·87	− 23

13th, a rate of 2·02 inches per hour; 0·97 inches in 25 minutes at Cathcart (Forest) on 13th, a rate of 2·33 inches per hour; and 0·70 inches in 12 minutes at Somerset East on 4th, a rate of 3·50 inches per hour. *Thunderstorms*, on the whole, were of about the usual frequency, although exceptionally numerous at a few stations; in all, 553 instances of such occurrences were noted on 26 days of the month, being most widely distributed on 13th, 4th, 28th, and 12th. The two exceptional dates were the 17th and 18th. *Hailstorms* were of unusual violence and wrought destruction in many places: *e.g.* at Middlecourt (Wodehouse) and Whittlesea on the 2nd, hail wrought a considerable amount of damage, especially to fruit at the latter place, where the stones were found to average 6 ounces in weight. Violent storms of hail were also experienced at Lauriston (Barkly East), the forest station of Thaba N'doda (Kingwilliamstown division) and Armadale in the Sunday's River Valley on the 4th; at Lauriston considerable damage was done to standing crops, one farmer losing 200 bags of wheat; at Thaba N'doda a deal of damage was done to the forest, some of the stones there measuring 6½ inches in circumference; in the neighbourhood of Armadale several ostriches were killed, some of the stones found weighing 7 and 8 ounces, even after having melted somewhat; at Glen Harry, on the 28th, a hailstorm broke eighteen panes of glass at the station offices. In all, forty-seven such storms were reported, occurring on thirteen days, but most widely on 4th. No *snow* or *sleet*.

Temperature, Cloud, and Wind.—The mean temperature of the month was unusually high, being 71°·3 or 1°·6 warmer than last month and 3°·0 warmer than February of 1913. The mean maximum (82°·2) is 2°·4 higher than during January, and 4°·6 higher than in February of last year; while the mean minimum (60°·5) is 1°·0 above the corresponding value for the preceding month, and 1°·5 above that for February, 1910. Compared with the normals the mean monthly temperature was 1°·4 higher than usual, the days being 1°·7 and the nights 1°·2 warmer than the corresponding averages. The mean monthly range (21°·9) was therefore 0°·5 more than usual. At the separate stations the mean monthly temperature was above the average mostly by one to two degrees, the excess varying, however, from 0°·0 at Mossel Bay to 4°·6 at Hanover. Two exceptional stations were Evelyn Valley and Hopefountain, which were 1°·7 and 0°·3 cooler than usual. Similarly the mean maxima were commonly considerably above the average, mostly by one to two degrees along the South and South-east Coasts, rising to three and four degrees in the interior, but ranging from 0°·7 at Dunbrody to 4°·8 at Queenstown. At a few stations chiefly in the east, however, the days were about one degree colder than usual, *e.g.* Kingwilliamstown, Umtata, Evelyn Valley, Amalienstein, while the deficit increased to 1°·8 at Hopefountain. At Mossel Bay and Heidelberg in the South Coast division, as also at Aliwal North, the night temperatures were about one degree lower than usual, whilst the deficit at Evelyn Valley increased to 2°·9 and decreased at Kokstad and Teyateyaneng to less than half-a-degree. With these exceptions the mean minima were above the normal usually by one to two degrees, the excess varying, however, from 0°·3 at Queenstown to 5°·7 at Hanover. The mean warmest station was Robertson with a temperature of 78°·2, and the mean coolest, Blaauwberg Strand, with 66°·6, a difference of 11°·6. The highest mean maximum was 93°·5 at Kimberley, and the lowest mean minimum, 53°·4 at Teyateyaneng. The highest temperatures of the month were most widely registered during an unusually hot spell from 9th to 12th, mostly on 10th, during which period temperatures ranging from 100° to 111° were recorded at a large proportion of our stations; extreme maxima also occurred at isolated stations on 2nd, 5th to 7th, 13th, 14th, 18th, 21st, and 25th. There can hardly be said to have been any decided cool spell during the month affecting any very large area, but generally speaking it may be said that the extreme minima in the South-west mostly occurred during the first week, those in the South and South-east about the middle, and those in the extreme East and centre of the Colony during the last week of the month; extreme minima were registered on altogether eighteen days of the month. The mean value of the highest readings was 96°·3, being 4°·4 higher than the previous month and 4°·7 higher than in February 1910; the corresponding value of the lowest readings was 52°·5, or 0°·2 higher than in January last, and 2°·8 higher than during the corresponding month of last year. The mean monthly range (43°·8) was therefore 4°·2 and 1°·9 more than in January last and February, 1910, respectively. Temperatures of 100° or more occurred at sixteen stations, several of these having two to three days on which such high readings were registered consecutively. The extreme readings for the month were 111° F. at Robertson on 16th and 43°·0 at Evelyn Valley on 12th, an extreme monthly range of 68°. No *frost* was noted during the month. At Retreat, in the Cape Peninsula, the mean minimum on grass was 55°·4, the same as in February of last year, and 4°·6 lower than the shade minimum; the temperature there ranged from 69°·2 on 11th to 44°·0 on 26th.

The mean amount of *cloud* (42 per cent.) was unusually low, being 6 per cent. less than last month and 10 per cent. less than in February of 1910. The mean amount of sky obscured over the various sections of the country was mostly 30 to 35 per cent., but increasing to 47 per cent. along the South Coast, 48 per cent. over the South-east, and 52 per cent. in Kaffraria; inland it was mostly about 20 per cent., but increased to

56 per cent. at Kimberley, and 65 per cent. at Hopefountain. It ranged in amount from 15 per cent. at O'okiep to 67 per cent. at Port St. John's and Port Nolloth. *Fogs* and *mists* were of about the usual frequency, 129 instances of this phenomenon being noted on twenty-five days, most numerously on 2nd to 4th, 8th, 18th to 22nd, 24th, and 27th. The prevailing *winds* were mostly from an easterly direction (NE. to SE.) most commonly south-easterly; but westerly along South Coast, north-easterly at Mochudi and Teyateyaneng, and south-west at Durban. At Kimberley north and south-west winds were of equal frequency. The mean *force* was unusually low, being 1·78 on the Beaufort Scale, corresponding to a velocity of 7·3 miles per hour, or 0·3 mile per hour less than in January and 0·6 mile per hour less than in February of last year. The winds were of fairly uniform strength over the whole country although decreasing in strength eastwards and inland. The Royal Observatory records show an increase of SSE. and SW. winds, but a marked decrease of all others, particularly those from NW., the mean force there corresponding to a velocity of 6·1 miles per hour, or 1·9 miles per hour less than usual. *Strong winds* and *gales* were more frequent than usual, being noted at twenty-six stations on fourteen days of the month, chiefly the 28th. Some of these caused considerable damage as at Butterworth on 4th when buildings and trees were blown down, and at Kruis River on 13th when a strong north-westerly wind of short duration unroofed several houses, blew down the native church in the town, and caused other damage. *Hot winds* were experienced at three stations on 10th and *duststorms* at two stations on 1th.

TEMPERATURE

Station	Mean Max	Mean Min	Monthly Mean	Abs Max.	Date	Abs Min	Date
Royal Observatory ...	82·1	62·5	72·3	99·2	10th	53·7	16th
Capetown (S A C)	85·5	61·6	73·5	101·5	9th	55·0	7th
Blaauwberg	74·0	59·1	66·6	86·0	9th	53·5	5th
Groot Constantia	79·7	60·0	69·8	99·0	10th	57·0	5th & others
Wynberg...	80·2	61·0	70·6	104·0	10th	55·0	5th
Retreat	81·1	60·0	70·6	103·7	10th	50·5	26th
Elsenburg Agricultural College	85·2	60·5	72·8	105·0	10th	54·1	19th
Danger Point	72·9	61·6	67·2	80·0	10th	55·0	14th
Groot Drakenstein ...	89·0	62·8	75·9	108·1	9th	53·8	6th
Robertson (Experimental Farm)	89·1	67·3	78·2	111·0	10th	63·0	16th
O'okiep	86·8	61·5	74·2	99·0	9th	50·5	14th
Port Nolloth	67·5	53·5	60·5	83·0	25th	51·0	20th & 22nd
Mossel Bay	76·7	62·6	69·6	91·0	10th	56·0	19th
Heidelberg	84·3	60·0	72·2	110·5	10th	47·0	4th
Dunbrody	89·5	63·3	76·4	110·0	10th	50·7	25th
Cape St Francis	74·8	66·5	70·6	83·0	10th	58·0	16th
Port Elizabeth	77·8	65·1	71·4	86·0	10th & 11th	60·0	14th
Cape Agulhas	74·3	63·9	69·1	81·0	10th	58·0	14th
Storm's River	78·5	60·5	69·5	102·5	10th	53·0	16th
George (Plantation) ...	77·2	60·1	68·6	102·0	10th	54·0	25th
Amalienstein	88·2	62·2	75·2	106·0	10th	54·0	20th
Hanover	88·0	59·9	74·0	94·0	9th & 21st	48·0	28th
Murraysburg ...	89·1	58·3	73·7	96·0	11th & 12th	50·0	24th
Kimberley	93·5	61·5	77·5	100·0	2nd & 7th	50·1	15th
Bedford	85·5	58·9	72·2	102·0	9th, 10th, & 11th	51·0	17th
Lovedale...	88·0	62·0	75·0	102·0	11th	51·0	28th
Cathcart	79·2	57·3	68·2	92·8	12th	49·1	16th
Sydney's Hope	81·8	61·2	71·5	104·5	10th	54·5	16th
Kingwilliamstown... ...	84·4	62·9	73·6	101·0	10th	58·0	13th, 24th & 28th
Chiselhurst	85·8	63·0	74·4	97·0	10th & 11th	50·0	13th
Evelyn Valley	74·4	54·2	64·3	90·0	10th	43·0	12th
Aliwal North	86·3	54·7	70·5	92·0	12th	47·5	26th
Queenstown	86·2	58·7	72·4	99·0	11th	48·0	26th
Port St. John's	80·6	66·8	73·7	86·0	14th	62·0	26th
Kokstad	79·4	54·0	66·7	91·3	12th	44·1	26th
Tabankulu	79·3	57·1	68·2	90·0	12th	47·1	25th
Umtata	80·3	61·5	70·9	92·0	10th & 11th	53·0	26th
Teyateyaneng	84·5	53·4	69·0	90·0	18th	48·0	25th & 26th
Mochudi	89·8	61·5	75·6	97·0	5th & 6th	52·0	28th
Hopefountain	77·1	58·3	67·7	85·0	13th	51·7	27th
Means	82·2	60·5	71·3	96·3	—	52·5	—
Extremes ...	—	—	—	111·0	10th	43·0	12th

At the Royal Observatory the mean barometric pressure was 29·97 inches, or the same as the average, ranging from 30·11 inches on the morning of the 24th to 29·81 inches on the morning of the 26th. Taken as a whole, the absence of rain and the unusual weather seem to have been favourable to fruit crops, but caused severe loss to all other growing crops, whilst the veld was in a most unsatisfactory condition for winter food purposes.

OBSERVERS' NOTES.

Vruchtbaar (Wellington). The rainfall of over 1 inch on the 14th was most welcome after the burning hot weather of the 8th and 9th which played havoc with the vineyards. Busy with the gathering of the grapes for wine-making. Crop, all round, above the average.

Kruis River.—A very hot month indeed. Crops of mealies entirely ruined; melons, large quantities, burnt by the sun. On the 13th, a terrific storm of short duration came over; blew off several roofs on this and on the neighbouring farm; a native church was blown down in town; and other slight damage. Duration of storm only twenty minutes, direction NW. by W.

Uitenhage Park. A very hot month, very trying to vegetation, foliage much burnt by hot wind on 15th. Rainfall much below average of last nine years.

New Bethesda (Graaff-Reinet). Good fruit season. Peaches very plentiful and good. River in heavy flood on 2nd and 27th, owing to heavy thunderstorms about 15 miles to north of village. Lucerne crops very poor; no growth for want of rain, and unprecedented scorching heat.

Schuilhoek (Hanover). Great heat experienced during month.

Sutherland. We are expecting frost again soon; only a few days warm weather here.

Theefontein (Hanover). Winds light and variable. South-easter blowing with force on 23rd, 24th, and 25th, rain resulting on the three following days, but very light and disappointing, and falling in spots. Drought generally unbroken. Stock, bar scab, fairly healthy. "Trekboer" plague raging with great virulence, causing trouble and loss to local victims, not to speak of an undue amount of lurid language.

Douglas. Rain very badly needed. Veld dry. Rainfall for February, 1910 (4·38 inches), against 1·69 in this month. Very fair fruit crops. Peaches and nectarines specially suffered through fruit fly.

Griquatown. Severe drought

Karree Kloof.—Very dry.

Sunnyside (Hay). The signs for rain during the month have been very promising, as many days were characterized by fine clouds rising in every direction, and, judging from the appearance, one would expect the country to be flooded, but somehow the clouds seemed to content themselves in rolling away and disappearing in a most mysterious manner. Veld entirely shrivelled up, and nearly all crops of mealies, etc., dead or on the verge of dying. Stock very fair in condition, considering the strained circumstances under which they have to exist.

Clifton (Sterkstroom). A fair month. Veld short. Crops for winter feeding late. Mealies poor. Plenty of fruit. Rain on 13th fell on only top portion of farm.

Herschel.—Mealie, only crop, suffered from drought.

Lyndene (Albert). Much heat during the month and consequent damage. Veld in fine condition.

Sunnymead (Albert). Very scanty rains for February. Bad lookout for the winter if rain does not come shortly. Stock healthy.

Thibet Park (Queenstown). Very severe drought up to the 27th.

Kokstad.—Latest rains just in time to save mealie crops. Great heat during month.

Somerville (Tsolo). The crops that were backward in January have made great progress in February, and promise to be quite up to the average.

Tent Kop (Maclear). Unusually many thundershowers and storms for the time of year, with unusually little continuous rain and very much fine dry weather.

Armadillo Creek (Vryburg).—This is usually the wettest month. All dams empty. Winter prospects will soon look serious. There will practically be no mealie crop in Southern Bechuanaland.

Nottingham (Mafeking).—The season has been deplorably dry, and crops throughout district are practically a failure. The veld made but little growth, and the prospect for the winter is exceedingly bad.

Groot Drakenstein.—A hot and dry month, although the rainfall was a third above the average; it all fell in one shower. The hot weather during the second week caused considerable damage to vineyards from scorching, and the shower on the 14th was of great benefit. The minimum reading on the 10th, of 75°·9, was a record for here. Mean temperature of month 3°·2 above the average. Rainfall 0·30 inches above the average.

Kokstad (Coyte).—Rain has been much needed, the heavy fall on the last day of the month was very welcome. Ploughing is late owing to drought.

TRANSVAAL.

OBSERVERS' WEATHER REPORTS FOR FEBRUARY.

SUMMARY.—The rainfall for the month has been seriously deficient over practically the whole Province, parts of the eastern and western borders and a small portion of the high veld only excepted.

The rainfall for the season (eight months) has also been generally deficient, especially over the south-western districts. Parts of the eastern and western borders, some of the south-eastern districts, and the neighbourhood of Pietersburg have, however, enjoyed an eight months' rainfall equal to or above the average. Hailstorms during February have been infrequent and generally light.

BARBERTON DISTRICT

Barberton.—During the first half of the month there was practically no rain, and the drought, which had lasted for nearly four weeks, did considerable damage to the crops; in particular the mealies suffered a lot, and those planted late will be almost an entire failure. The rainfall is considerably below the average. More wind than usual has been experienced. (A. C. Jackman.)

BETHAL DISTRICT—

Leeuwkuilen, P.O. Davel.—Heavy dew has fallen practically the whole of the month. From the 23rd to the 27th the weather has been quite wintry. (W. J. Wayland.)

BLOEMHOF DISTRICT—

Katrina (Christiana).—The weather came up very promising on several occasions during the afternoons, but passed off without rain. Veld and crops are very dry, a serious outlook for the winter. (P. W. Lombard.)

ERMELO DISTRICT—

Elspan.—This month has been exceptionally cold for the time of year, and very dry, south-easterly winds prevailed during the whole month, with the exception of one week in the middle of the month. (A. Middleton.)

Ermelo.—The weather was fairly warm during the whole of the month. Strong winds prevailed, chiefly from the east. (A. Drummond.)

LYDENBURG DISTRICT—

Belfast. A very dry month; strong, drying winds were experienced at the opening of the month and at intervals to its close. The air has been cold at times in the mornings and evenings; 2·8 degrees of frost was registered on the morning of the 27th. (G. J. Imrie.)

MIDDELBURG DISTRICT—

Middelburg.—The characteristics of this month's weather have been the changeableness of the wind and the small amount of rainfall at long intervals. The wind has veered from south to north-west at intervals of two or three days throughout the month in most tantalizing fashion; scarcely had clouds blown up from the north-west and rain been on the point of falling when time after time the wind veered round to a south-easterly direction and cleared the sky in a few hours. The rainfall has been half the average fall during February for the past eight years, has mostly been in small quantity, being put an end to prematurely by change of wind, and at intervals which were too long to be of substantial benefit to crops. Whilst the days have been hot, a maximum temperature of 89 degrees being recorded in the middle of the month, the nights have cooled considerably, a minimum of 44 degrees being recorded on 26th. This minimum is the lowest recorded for February for the past eight years. This season's rainfall has been very low, and crops are everywhere a failure in consequence. (Dr. H. A. Spencer.)

RUSTENBURG DISTRICT—

Cyferbult.—Mostly fine and quiet in the mornings, but often cloudy in the afternoons, with high winds. Much threatening weather was experienced, but the clouds always dispersed. Rain badly wanted. (J. Romm.)

SWAZILAND—

Piggs Peak.—Exceptionally dry for the time of year; crops suffering. (Swaziland Police.)

WATERBERG DISTRICT—

Mamiaanshoek.—The rainfall came rather late for maize. Veld good as yet. (C. R. Prance).

Twenty-four Rivers.—The temperature was unusually low for February. (Mrs. M. K. Peacock.)

ZOUTPANSBERG DISTRICT—

Mow Cop.—Very hot and dry weather was experienced this month. (Bett Bros.)

Rainfall, February, 1911.

CAPE PROVINCE.

CAPE PENINSULA :	*Inches.*
Royal Observatory (*a*) 12-inch gauge	0·50
Capetown (Fire Station) ...	0·41
Do. (South African College)	0·45
Do. (Signal Hill)	0·33
Camps Bay	0·35
Table Mountain (Disa Head) ...	0·58
Do. (Kasteel Poort)	1·05
Do. (Waai Kopje) ...	1·33
Do. (St. Michael's)...	1·47
Woodstock (The Hall)	0·34
Kenilworth	0·26
Wynberg (St. Mary's)	0·31
Groot Constantia	0·32
Tokai Plantation	0·44
Muizenberg (Rustenvrede) ...	0·25
Cape Point	0·27
Blaauwberg Strand	0·45
Robben Island	0·39
Maitland Cemetery	0·36
Tamboers Kloof	0·50
MacLears Beacon	1·20
Waai Vlei	1·20
Woodhead Dam	1·08

II. SOUTH-WEST :	
Eerste River	0·35
Klapmuts	0·95
Stellenbosch (Gaol)	0·81
Somerset West	0·78
Paarl	0·83
Wellington (Gaol)	1·41
Groot Drakenstein (Weltevreden)	0·89
Tulbagh	0·25
Rawsonville	0·13
Caledon	0·48
Worcester (Gaol)	0·00
Hex River...	0.07
Karnmelks River	0·27
Lady Grey (Division Robertson).	0·35
Robertson (Gaol)...	0·35
Do. (Govt. Plantation) ...	0·23
Montagu	0·59
Danger Point	0·70
Elgin Plantation	0·94
Elsenburg Agricultural College...	0·89
Roskeen	1·38
Vruchtbaar	1·28
Agric. Exp. Farm (Robertson) ...	0·22
Ceres (Heatlie)	0·57
Waverley (Tulbagh)	0·65
Dwaars Riviers Hoek	1·05

III WEST COAST :	*Inches*
Port Nolloth	0·00
Do. (Lieut. Barber) ...	0·00
Klipfontein	0·00
Kraaifontein	0·06
O'okiep	0·08
Springbokfontein...	0·00
Garies	0·00
Van Rhyn's Dorp	0·00
Dassen Island	0·42
Kersefontein	0·00
Malmesbury	0·28
Piquetberg	0·10
Hopefield	0·20
Algeria (Clanwilliam)	0·25
Cedarberg (Clanwilliam) ...	0·69

SOUTH COAST :	
Cape Agulhas	0·97
Swellendam	3·05
Potberg	1·55
Grootvaders Bosch	4·11
Heidelberg	1·18
Riversdale...	1·70
Mossel Bay	2·48
Great Brak River	2·20
George	3·41
George (Plantation)	3·55
Millwood	2·34
Sour Flats...	1·36
Buffel's Nek	2·77
Plettenberg Bay	2·17
Harkerville	3·47
Blaauwkranz	4·37
Lottering	4·02
Storms River	2·98
Witte Els Bosch	4·11
Humansdorp	1·67
Cape St. Francis	1·77
Kruis River	1·28
Uitenhage (Gaol)... ...	1·11
Do. (Park)... ...	0·76
Armadale (Blue Cliff) ...	2·13
Dunbrody	1·06
Port Elizabeth (Harbour)	0·94
Do. (The Slip)	1·14
Do. (Emerald Hill) .	1·10
Sharks River (Nursery)	1·39
Centlivres	0·58
Edinburgh	2·94
Gamtoos Station ... ... ,	1·38

V. SOUTHERN KAROO:	Inches.
Triangle	0·70
Pietermeintjes	0·97
Ladismith	0·15
Amalienstein	0·07
Oudtshoorn	0·65
Vlaakte Plaats	0·00

VI. WEST CENTRAL KAROO:	
Prince Albert	0·90
Beaufort West (Gaol)	0·88
Dunedin	0·46
Nels Poort	0·03
Camfers Kraal	0·23
Krom River	0·12
Roosplats	0·26
Lemoenfontein	1·07
Baakens Rug	0·26
Willowmore	0·47
Rietfontein	0·17
Steytlerville	0·90

VII. EAST CENTRAL KAROO:	
Aberdeen (Gaol)	1·92
Aberdeen Road	0·30
Klipplaat	0·39
Kendrew (Holmes)	0·73
Graaff-Reinet (Gaol)	2·02
Do. (Eng. Yard)	1·90
New Bethesda	0·77
Roodebloem	1·70
Glen Harry	1·90
Wellwood	0·61
Do. (Mountain)	0·42
Bloemhof	0·72
Jansenville	1·16
Roode Hoogte	1·20
Klipfontein	0·63
Cranemere	1·31
Middlewater	0·97
Somerset East (Gaol)	2·46
Middleton	1·01
Spitzkop (Graaff-Reinet)	2·76
Gordonville (Graaff-Reinet)	1·21
Muchputfontein	1·73
Zeekoe River	0·88

VIII. NORTHERN KAROO:	
Sutherland	0·02
Fraserburg	1·01
Carnarvon	0·20
Brakfontein	0·51
Victoria West	0·08
Britstown	1·54
Murraysburg	0·74
De Kruis (Murraysburg)	0·71
Richmond	0·87
Hanover	0·65
Theefontein	0·65
Philipstown	0·03
Petrusville	0·00
The Willows (Middelburg)	1·11
Colesberg	2·19
Tafelberg Hall	1·04
Varkens Kop	3·04

VIII. NORTHERN KARROO (*continued*):	Inches.
Culmstock	2·55
Cradock (Gaol)	2·78
Witmoss	0·28
Maraisburg	3·31
Steynsburg (Gaol)	3·04
Tarkastad	1·72
Drummond Park	1·83
Waverley	3·01
Schuilhoek	1·37
Vosburg	0·00
Zwavelfontein	0·00
Hotweg Kloof (Cradock)	2·28
Thebus Waters	2·64
Ruightersfontein	2·04
Klipkraal	0·13

IX. NORTHERN BORDER:	
Pella	1·20
Kenhardt	0·09
Upington	0·24
Trooilapspan	0·27
Prieska	0·28
New Year's Kraal	0·25
Dunmurry	0·68
Karree Kloof	0·00
Griquatown	0·00
Douglas	1·86
Hope Town	0·07
Newlands (Barkly West)	0·49
Barkly West	0·44
Kimberley (Gaol)	0·15
Do. Stepheus	0·53
Strydenburg	0·25
Douglas (Vos)	1·69
Rietfontein (Gordonia)	0·14
Stoffkraal	0·50
Sunnyside	0·81
Rocklands	0·48
Paters Park (Gordonia)	0·49
Sydney-on-Vaal	0·17
Warrenton	0·80

X. SOUTH-EAST:	
Melrose (Division Bedford)	0·67
Dagga Boer	1·46
Alicedale	0·45
Bedford (Gaol)	2·09
Do. (Hall)	2·02
Sydney's Hope	1·68
Adelaide	2·15
Atherstone	1·12
Fort Fordyce	3·25
Grahamstown (Gaol)	1·68
Heatherton Towers	1·32
Sunnyside	1·69
Fort Beaufort	2·86
Katberg	4·30
Seymour	2·94
Glencairn	2·22
Lovedale	1·95
Port Alfred	0·83
Hogsback	7·04
Peddie	1·94
Exwell Park	1·63
Keiskamma Hoek	1·77

X. SOUTH-EAST (continued):	Inches.
Cathcart (Gaol)	4·10
Cathcart (Forman)	4·26
Cathcart	4·14
Thaba N'doda	5·61
Evelyn Valley	9·15
Crawley	3·09
Pirie Forest	4·63
Isidenge	4·60
Kologha	4·76
Kingwilliamstown (Gaol)	4·90
Fort Cunynghame	7·41
Kubusie	6·35
Quacu	3·65
Blaney	1·05
Kei Road	3·80
Berlin	1·85
Bolo	2·31
Fort Jackson	0·75
Prospect Farm (Komgha)	4·66
Komgha (Gaol)	3·89
Chiselhurst	2·58
Cata	5·49
Wolf Ridge	4·88
Dontsah	4·28
Mount Coke	1·35
Albert Vale (near Bedford)	1·07
Huxley Farm	4·33
Amabele Junction	3·94
Insileni (Kingwilliamstown)	4·28
Kingwilliamstown (Pym)	2·49
Eastover	1·38

XI. NORTH-EAST:	
Venterstad	1·79
Mooifontein	2·55
Burghersdorp (Gaol)	3·97
Lyndene	3·12
Thibet Park	2·57
Sterkstroom (Station)	2·39
Rocklands	1·66
Aliwal North (Gaol)	1·95
Poplar Grove	2·76
Jamestown	2·61
Whittlesea	4·26
Queenstown (Gaol)	2·67
Do. (Beswick)	2·93
Middlecourt	6·18
Dordrecht	4·50
Herschel	3·50
Lady Grey	3·47
Lauriston	2·68
Lady Frere	2·73
Contest (Near Bolotwa)	2·91
Keilands	2·01
Barkly East	2·45
Blikana	1·67
Hughenden	2·79
Indwe (Collieries)	3·64

XI. NORTH-EAST (continued):	Inches.
Bensonvale Inst. (Herschel)	2·13
Sunnymeade	0·95
Clifton (Sterkstroom)	3·01
Edendale	3·28
Strydpoort	4·78

XII. KAFFRARIA:	
Ida (Xalanga)	3·28
Slaate (Xalanga)	5·38
Cofimvaba	2·72
Tsomo	2·79
N'qamakwe	2·63
Engcobo	5·63
Butterworth	2·60
Woodcliff	6·06
Kentani	5·35
Maclear	5·19
Bazeya	5·09
Willowvale	3·89
Mount Fletcher	3·75
Somerville (Tsolo)	3·16
Elliotdale	4·09
Umtata	3·52
Cwebe	5·64
Tabankulu	3·84
Kokstad	3·54
Do. (The Willows)	3·20
Flagstaff	3·81
Insikeni	5·31
Port St. Johns	2·91
Kilrush (Sneezewood)	5·71
Wanstead	5·32
Maclear (Station)	4·51
Umzimkulu (Strachan)	5·71
Lusikisiki	3·00
Tentkop (Elands Height)	6·14
Elton Grange	5·82
Dihoha	2·58
Ndabakazi	2·83

XIII. BASUTOLAND:	
Mohalies Hoek	2·40
Maseru	2·26
Teyateyaneng (Berea)	1·06
Moyeni Quthing	1·89
Qachas Nek	7·55

XIV. BECHUANALAND.	
Taungs	1·33
Vryburg	2·29
Mafeking	3·28
Zwartlaagte	1·28
Nottinghame	1·08
Masilibitsani	0·35
Armadillo Creek	0·98
Mochudi	4·67
Morokwin	0·98

NATAL.

Umhlangeni (Lower Umzimkulu)	4·06
Winkel Spruit	10·51
Ottawa	3·01
Mount Edgecombe	2·84
Cornubia	4·58
Saccharine	4·02
Milkwood Kraal	3·40
Blackburn	2·99
Cedara (Vlei)	5·32
Giant's Castle	3·68
Weenen	5·45

TRANSVAAL.

	Inches.		Inches.
Barberton	3·13	Pretoria (Arcadia)	4·44
Komatipoort	5·88	Modderfontein	2·64
Bethal	3·26	Rustenburg	3·00
Christiana	0·81	Standerton	2·45
Bloemhof	0·85	Mbabane	4·68
Carolina	1·33	Volksrust	4·81
Ermelo	1·32	Wakkerstroom	3·46
Vereeniging	3·52	Nylstroom	1·89
Heidelberg	4·72	Potgietersrust	1·50
Lichtenberg	3·32	Krugersdorp	5·64
Pilgrim's Rest	3·04	Joubert Park	3·84
Belfast	1·75	Observatory	3·10
Zeerust	6·37	Wolmaransstad	2·78
Middelburg	2·22	Pietersburg	0·59
Piet Retief	2·87	Louis Trichardt	1·22
Potchefstroom	3·74	Leydsdorp	4·12
Klerksdorp	1·61		

Departmental Notices.

FARM EMPLOYMENT.

Applicant, aged 16, is desirous of obtaining employment on a farm with a view to learning all he can regarding mixed farming. Is a well-built lad, and anxious to start work, and willing to make himself useful in any capacity. E. TURNBULL, The Residency, Empangeni Zululand. [4]

Hard-working energetic farm hand, 24 years of age, with knowledge of common nursery work and forestry (wattles and gums), stock, and general farming, wants situation on farm within fi e mile radius from railway station. Good references. Strictly sober.—H. BERNHARD, c/o Wm. Clark, Esq., Kenterton (Private Bag), via Esperanza, Natal. [4]

Applicant, aged 18, desires employment on a farm. Has been brought up on a farm, and understands the handling of sheep, cattle, horses, and general agriculture.—J. L. M. DANIEL, Rietfontein No. 64, Platrand P.O., via Standerton, Transvaal. [5]

Applicant, aged 18, desires employment on a farm. Has had no previous experience of farm work.—G. M. MARITZ, Rietfontein No. 64, Platrand P.O., via Standerton, Transvaal. [5]

Applicant, aged 27, desires to obtain a situation on a farm, anywhere in the Union of South Africa. Accustomed to working with horses, mules, and oxen. Understands all kinds of farming (agricultural and stock), and has had eight years' experience of farming in Natal. Has knowledge of veterinary matters, and understands castration of all classes of stock.—H. H. WILLEY, Dwaar's Nek, Hatting Spruit, Natal. [5]

Experimental Farm, Potchefstroom.

SEED FOR DISPOSAL.

Wheat.—Australian "Early"—suitable for irrigated land; price 12s. 6d. per 100 lb. delivered free on rail at buyer's nearest station.

This price is subject to alteration without notice.

Application for this seed should be made as early as possible.

Orders must be accompanied by remittance, or if the seed is to be forwarded on the c.o.d. system, this authority must be given by applicant. Cheques and Money Orders should be drawn in favour of the General Manager, Experimental Farm, Potchefstroom, from whom any further particulars can be obtained. When remitting by cheque, exchange must be added. Postal Orders should be endorsed.

ALEX HOLM,
General Manager.

Agricultural Show Dates, 1911.

TRANSVAAL PROVINCE.

Zoutpansberg.—17th May.
Rustenburg.—24th and 25th May.
Pretoria.—30th May to 1st June.
Barberton.—23rd June.

NATAL PROVINCE.

Vryheid.—June (date not fixed).
Newcastle.—13th and 14th June.
Dundee.—15th and 16th June.
Ladysmith.—20th and 21st June.
Victoria County.—21st June.
Alfred County.—21st June.
Weenen (Estcourt).—22nd and 23rd June.
Umzinto.—28th June.
Pietermaritzburg.—29th and 30th June and 1st July.
Camperdown.—3rd July.
Durban.—5th, 6th, and 7th July.
New Hanover.—20th July.
Richmond.—20th July.
Mid Illovo.—10th August.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

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Swiss Milch Goats Again.

The information published in the last issue of the *Agricultural Journal* has elicited some further interesting details which appear in the correspondence pages of the current issue. Those who have addressed letters to this office asking for information cannot do better than turn to the communications from Messrs. Joubert and Byrnes, the latter being particularly interesting to those seeking animals of this description. In Mr. Joubert's letter the hints we dropped as to the possibility of Malta fever being transmitted by these goats seem to be discounted, and as none of the other breeders or owners mention this matter it cannot have much ground. Yet another point has to be mentioned in connection with these animals and that is in connection with the East Coast fever areas. In most of the districts where this disease is rife another disease due to ticks, which is just as deadly to sheep and goats, is also common. The disease in question is known as heartwater. It therefore behoves all in these districts who desire to keep these goats for their milk supply to see them kept clear of ticks.

The Mederer Preserving Chamber.

Visitors to the Johannesburg Show Ground are mostly interested in the semi-circular building which has been there for some time now and is known as the Mederer Preserving Chamber. Some further particulars with reference to experiments carried out therein appear in the current issue, which are of great value and should be carefully noted by those interested. The principle of this method of reducing and maintaining a low temperature can scarcely be described as exactly new, but, so far as our information carries us, it is the first time that it has been adapted to the preservation of foodstuffs on anything like a large scale. Evaporation has been practised for ages in countries like India for cooling dwelling-houses, the method there adopted being that of simply hanging thick grass mats on the outer portions of deep verandahs, saturating these with moisture and the natural circulation of the air does the rest. In this case, of course, all that is wanted is to keep out the extreme heat and allow people to get some rest and sleep. In this country the virtues of air circulating through a saturated fabric have been recognized for years. In the days before the luxuries of civilization reached such places as Kimberley, with its great heat in the daytime, the only way to secure a cool drink was by modifying the well-known principle of the canvas

water bag in order to keep the favourite potable liquids cool. This was done in the bars and other places of refreshment by the use of perforated zinc lined with wet bagging or Hessian placed in such a position that a draught of air was secured. The resulting evaporation kept the drinks quite cool on the hottest of days in summer.

The Need for Cool Storage on the Farm.

As it has been suggested that this method of lowering the temperature might be adopted for farm purposes, it would be as well to institute further investigations. It should always be remembered that the rarefied condition of the atmosphere at the altitude of a site like Johannesburg causes in itself a great deal of natural evaporation. This would greatly assist a contrivance like the Mederer Chamber, and before recommending its general adoption it would be far safer to make a series of tests in conditions not quite so favourable, say, at lower elevations, and later on even on the coast. As the farmers of the interior undoubtedly need some simple kind of cool storage in order to assist them in their various operations, it should pay them to look into the methods adopted by their confreres in other parts of the Union, methods which have been proved to be effective by experience. For ordinary purposes it is not necessary to reduce the temperature to freezing point, all that is wanted is a low temperature which can be kept fairly even. The viticulturists of the Western Province of the Cape have been faced with this problem ever since they began making wine. They have solved the problem by using the methods which have been found effective for centuries in Europe and constructed their cellars in such fashion as to secure the requisite temperature without the use of refrigeration or any other artificial or mechanical means.

The Viticulturists' Method.

There are several ways of securing the desired end, but each and all are based on the principle of stout walls and very thick ceilings. In such places as Stellenbosch, Paarl, Wellington, and the Drakenstein Valley the heat of summer is excessive, yet they contrive to turn out a very large proportion of the best wine made in the country. Now, for the manufacture and maturing of good sound wine a low, even temperature is one of the prime necessities, and this is secured by so constructing the wine cellars that heat is excluded to a very great extent. There is no reason at all why this principle should not be applied all over the country where similar conditions are essential to success. One of the most successful methods of building these cellars is to use nothing but clay. It was introduced to South Africa by the Huguenots and has held its own ever since. The system is known as "pisé" work. The method of construction is a bit slow but it is very effective. The clay is used almost, if not quite, dry. And only certain types of clay are found suitable. The material is pulverized and set in between planks somewhat after the method adopted in building concrete walls. Each layer is then carefully rammed down with heavy rammers. Walls of a good height can be built this way provided that the pulverized clay is spread very thinly and rammed carefully, as it then sets very closely. The walls must, of course, be very thick, say, at least from three feet at the

base to about two feet at the top. The roof is put on in the ordinary way and may be of galvanized iron, but it must have a good pitch in order to allow of a free circulation of air. The outside of the walls can be washed with cement if necessary. The ceiling should be very thick, at least several inches, and is usually constructed of wooden planks set on stout rafters, the whole being overlaid with a layer of clay set close. The rest is a matter of position to avoid the greater heat. For the high veld a portion of such a building might be sunk into the ground or run into a hillside. The temperatures remain very low and very even in such a building, and should be well suited for ordinary farm purposes.

Maize Export.

The full report of the meeting of the Maize Export Committee appears in this issue and it teems with interest. A careful perusal of the discussions will give a fairly full knowledge of the details which have to be considered and the problems to be solved in connection with this recently developed industry. The questions at issue between the various interests involved are largely those connected with the commercial aspect of the subject, but they are none the less of importance to the grower, who, as producer, is very deeply involved in every detail of the trade. We are promised later on some more information on the wider aspects when Sir Thomas Price returns, who has been studying the larger questions during his recent tour in America. It remains to be seen, from the cultural side, whether sufficient profit can be guaranteed to the grower in this country to encourage him to expand his operations and thus place the export trade on a stable basis, or use it, as other countries have done, as a stepping stone to better things. On the face of it, so far, it would seem that the production of mealies for South African consumption and the gradual building up of the necessary industries to that end on this side, should prove the more profitable course for a young country. Whether those industries should take the form of live stock, with, say, dairying and pig rearing as a basis, or branch off into the higher organized forms which lead to the establishment of factories and workshops can only be decided by experience. For the present the one guiding principle which should be persistently maintained in South Africa is, that of all our crops the mealie is the greatest, and everything possible should be done to encourage its production on the best, the soundest, and most profitable lines. To that end all should combine and never rest till we can boast as loudly of what the mealie does for South Africa as the American does of what the same crop has done for the States of the Middle West. When we can do that there will be little question as to which particular industry this country will look to as its mainstay.

Registration of Pedigree Stock.

The attention of stock owners in Natal is called to the fact that Mr. A. Holm, General Manager of the Experimental Farm at Potchefstroom, will visit Natal immediately prior to the Pietermaritzburg Agricultural Show for the purpose of inspecting pedigree stock which the owners desire should be registered in the South African Stud Book.

Barley for Malting Purposes.

Farmers interested in the question of growing barley suitable for malting purposes will be glad to learn that the South African Breweries, Limited, have imported a quantity of selected seed from Great Britain, comprising the finest types of Shropshire, Norfolk, and Californian varieties. This seed is being distributed upon particularly favourable conditions, and applications for same should be addressed, at an early date, to the General Manager, South African Breweries, Limited, P.O. Box 1099, Johannesburg.

Mr. Loudon M. Douglas.

Readers who have followed Mr. Loudon M. Douglas' articles contributed from time to time to the late Provincial Agricultural Journals on ham and bacon curing and allied subjects, will be interested to hear that he has been appointed Technical Adviser to the British South Africa Company in Rhodesia. Mr. Douglas leaves England on the 1st July with the intention of visiting all parts of Rhodesia and organizing, lecturing, and discussing the subjects of swine husbandry, bacon curing, the meat industry, and cognate subjects. He expects to be in Rhodesia for several months.

Loans for Vermin-Proof Fencing (Cape Province).

As there appears to be considerable ignorance in regard to loans for vermin-proof fencing in the Cape Province, it has been deemed advisable to call attention to the main provisions of the Act bearing on the subject in force in that part of the Union. This Act (No. 37 of 1909) was promulgated in December, 1909, and was framed "to provide for and regulate the issue of loans for or in respect of the construction of vermin-proof dividing fences". The Act authorizes the granting by Government of loans to the owners or occupiers of land (not being a Divisional Council, a Municipality, a Village Management Board, or a District Council) for the purpose of erecting vermin-proof fencing or of converting fencing into vermin-proof fencing. Such loans bear interest at the rate of 4½ per cent. per annum, calculated from the time of payment of the last instalment, and are made in three instalments. The first before the work in respect of which it is made is commenced, and of sufficient amount to complete half the fencing, more or less; the second on the completion of half of such work and of sufficient amount to complete the fencing, more or less, and then only upon a certificate having been furnished by the officer appointed to inspect the work to the effect that half the work has been well and substantially done, and that the style and construction of the work and the material used therein are in accordance with the regulations framed under the Act; and the third on completion of the fencing.

In making application for loans, the approximate length of the fencing proposed to be erected or converted, and the estimated cost and the time within which it will be completed, must be stated. Fencing constructed under this Act must be kept in good and efficient order until the loan has been repaid in full, failing which the owner may be called upon to repay the whole of the balance of the loan still

outstanding. All expenses (including preliminary interest) connected with any application for a loan and of inspection of the fencing during the progress of the work—or as soon as may be upon its completion—is payable by the applicant, and will form a charge against such loan. The method of repayment of loans is set out in the schedules of the Act.

Co-operative Maize Reports—(Transvaal).

The Government Agrostologist and Botanist (Transvaal) has received the following reports on trials made by farmers with seeds supplied to them for the purpose. Mr. J. H. van der Merwe, Ward Onder Harts River, District Lichtenburg, reports:—"I am sending you 10 lb. of Will's Dakota and 10 lb. of Will's Gehu maize seed (as a co-operative return for seed received from you). The crop suffered from drought and the stalks are rather low. Spring hares, crows, and meercats have done a considerable amount of damage to the crop on account of the lowness of the stalk. It does very well here, and I have carefully noted that it takes only ninety days to mature, and it would be possible to have two crops in one season." Reporting also on Will's Gehu maize, Mr. W. G. Lubbe, jun., Boschpoort, District Lichtenburg, writes:—"This seed was sown on the 13th December, 1910, in drills on dry grey soil; the second year on new lands. The season was not favourable for crops, as a great drought prevailed. The crop was harvested on the 17th April. The weight was 45 lb. Considering the drought we had, this crop answered very well. It was ripe in ninety days. The mealies are good, but too short in the stalk. We sow long mealies here so that the animals cannot reach the heads and destroy them."

Western Province Egg-Laying Competitions.

The Western Province Agricultural Society's Third Egg-Laying Competition concluded on the 30th April, and details of the results will be found in the usual monthly table published in this issue. The leading awards were as follows:—1st, C. H. van Breda, Eendragt, Rondebosch: Pen No. 35, Australian White Leghorns; total 646 eggs; weight 1169 $\frac{3}{16}$ oz. 2nd, C. S. Boyes, Ednam Road, Rondebosch: Pen No. 17, American White Leghorns; total 516 eggs; weight 1024 $\frac{1}{16}$ oz. 3rd, A. Aitken, Mill Street, Capetown: Pen No. 18, American White Leghorns; total 528 eggs; weight 1013 $\frac{5}{8}$ oz. The two gold medals offered by the Capetown Poultry Society were won as follows:—*Winter Test* (May to August), for the pen laying the greatest number of eggs: C. H. van Breda's Pen No. 35 (Australian White Leghorns), total 232 eggs. *Summer Test* (December to March), for the pen laying the greatest number of eggs: A. Aitken's Pen No. 18 (American White Leghorns), total 211 eggs.

The Society's Fourth Egg-Laying Competition commenced on the 16th May, 1911, and will continue for a period of twelve months. Twenty-six pens have been entered, comprising the following breeds:—White Leghorns, 13; Brown Leghorns, 4; Black Leghorns, 2; Black Minorcas (R.C.), 1; White Wyandottes, 3; Silver Wyandottes, 1; Buff Orpingtons, 1; Rhode Island Reds,

1. Three pens have been contributed by Kimberley, one by Petrusburg, Orange Free State, and one by Johannesburg, the remainder coming from Capetown and vicinity. The number of birds to a pen has been increased to six. As in previous contests, the birds will be trap-nested, and the pen laying the greatest weight of eggs will be declared the winner. After the 1st July, 1911, any eggs weighing less than 1½ ozs. will be disqualified, and any pens which have not laid 100 eggs by the 30th September will be returned. The present runs and houses will be re-used, two existing pens being thrown into one, thus giving each pen a run measuring 60 ft. × 10 ft. At a meeting of competitors and fanciers the following system of diet was decided upon, viz.:—Morning mash: 1 part bran, 3 parts pollard, 20 per cent. of beef scraps (by weight); lucerne to be added when green food not obtainable at the rate of 15 per cent.; fowls to be given as much as they will clear up readily. Green food to be given at midday whenever procurable. Evening grain: Winter—Wheat three times, oats twice, and mealies twice per week. Summer—Wheat four times, oats twice, and mealies once per week. All grain to be fed in litter. Grit, oyster shell, and charcoal always before the birds.

Spanish Hides and Skins Trade.

In the course of a report on the trade in hides and skins at Barcelona, the British Consul there writes: "With reference to the business in hides from abroad done in Spain, Consular advices to hand show that the rise in the price of Calcutta kips is causing a considerable falling off in the importation thereof into Spain, and that it will require a very marked set-back in prices to enable Calcutta kips to regain the position they have lost in this market. During the twelve months ended 31st December, 1910, official statistics of the Calcutta Customs-house give the exports to Marseilles and Barcelona as having been during 1910, 589,388 hides, whereas in 1909 they reached 602,147, a difference in one year of 12,759. As there are practically no shipments to the south of France, the above figures may be taken as representing the sales of Calcutta kips in Barcelona.

"South Africa" (continues the Consul) "exports large quantities of hides which it is considered might find a market in Spain if sellers arrange to ship carefully made-up assortments direct to Barcelona either with transhipment at the Canary Islands or at Marseilles, instead of as now insisting on shipping via London, at which port the charges are so heavy that, added to the extra freight from London to Spanish ports, the cost of the hides is rendered prohibitive. Also from Uganda it is suggested that hides and skins could easily be transported to Barcelona, but the same objection of shipping via London applies. The result is that what business is done at present in South African hides is in the hands of a Marseilles firm with branch houses on the African coasts. Another reason given for the falling off in the consumption of Calcutta hides, so far as the Spanish market is concerned, is to be found in the dissatisfaction of the buyers at the irregularity of the selections shipped, the wide latitude which the shippers allow themselves in the limits of weight and the heavy

shrinkage which so frequently occurs in weight during the voyage. In connection with the last remark it must be borne in mind that the market in question is after all a limited one, for, as no facilities are given for re-exportation, everything that goes into the country must be consumed there. Therefore, if importers for any reason receive goods which are unsuitable for the requirements of their customers, they can only dispose of them at a heavy loss."

New England Flint Maize.

The Government Agrostologist and Botanist (Transvaal) writes: "Mr. T. Loxton, Drinkwater, Ermelo, has sent me an ear of New England eight-row yellow flint maize measuring 13 inches in length. The ear is beautifully proportioned with very straight rows and remarkably *thick* grain, and bears a practically perfect tip, which is unusual in such a long ear. The only defect is the butt, which is weak and slightly irregular."

A Large Potato Yield.

Mr. Jas. W. Logan, jun., Lucas Kraal, Wolmaransstad, writes: "On the 16th December I cut up four Up-to-Date potatoes into twelve portions and planted them, using Fison's Potato Fertilizer. On the 25th April I dug them up and found the total weight of the tubers to be exactly 60 lb. One haulm produced tubers numbering twenty-eight and weighing 7 lb. Is this not a record?" With reference to this letter, the Acting Government Horticulturist (Transvaal) remarks that the yield was certainly very good, but that it does not constitute a record. Northern Star yielded as much as 56 lb. from one tuber.

Crotolaria Burkeana.

A correspondent at Zetland, P.O. Vaalboschbult, Transvaal, in a letter to the Government Agrostologist and Botanist, writes: "I am afraid I will not be able to eradicate the *Crotolaria burkeana* by ploughing as it appears to occur in small quantities all over the farm. I think some cattle take a liking to it and look for it, while others do not care for it. I have had some cattle here for over four years which have not had stiff-sickness yet, while others get stiff every time I bring them back."

Teff Grass Seed.

Mr. J. Wentworth-Sykes, Grasslands, Natal Spruit, Transvaal, writes: "I have received quite a budget of correspondence relative to my article on Teff Grass in your April issue, and am gratified to realize that farmers in the far corners of the Union are exhibiting a lively interest in this valuable forage grass. Having a large quantity of seed, I shall be glad to send a sample to any farmer for experimental purposes on receipt of stamps to cover postage. Australia and British East Africa are inquiring for seed, and as I know of no country but South Africa and Abyssinia that cultivates it, we have the monopoly so far and no importation can take place. For the last four years the demand for seed has been far greater than the supply. I know of several parcels changing hands last season at 4s. per pound, so it behoves farmers to secure seed before the sowing season and thus save disappointment."

Tall Fescue Grass *(Festuca elatior)*.

Mr. Joseph Burtt-Davy, Government Agrostologist and Botanist (Transvaal), has received the following letter from Mr. Conrad Appel, of Darmstadt, Germany:—"I have read with great interest your remarks regarding Tall Fescue in the *Agricultural Journal of the Union of South Africa*, February issue, and allow me to refer you herewith to our South German true Tall Fescue (*Festuca elatior*). Under separate cover by parcel post I am sending you 10 lb. of the true South German variety of Tall Fescue, and will be greatly obliged to you for making trials with this species, which is of a much better value than the New Zealand grown seed with which you have made your trials. Although the latter is much cheaper in price, many of my customers do not like it, and ask for a guarantee that I furnish true South German Rhenish seed. The New Zealand grown seed is not the true Tall Fescue, but another variety, the so-called *Festuca arundinacea.*"

In the course of his letter in reply, Mr. Burtt-Davy wrote:—"I have also to thank you for the 10 lb. sample which you have so kindly sent, and can assure you that it will give me great pleasure to distribute the same through different parts of the Transvaal where it can have a thorough test. I wish to point out that our reason for growing the New Zealand species is not only the lower cost of the seed, though this is of considerable importance where so much is added for freight. But my experience during the last eight years of experimental work with grasses in the Transvaal has shown me that the New Zealand species is the only one which has so far given successful results under the trying winter conditions prevailing on the bleak plateau of the Transvaal high veld. I am glad to say that my efforts to introduce this grass have been so far successful that we now have farmers with hundreds of acres of this grass well established. I am well aware that the Rhenish Tall Fescue is of finer quality than the other, but as the plant won't succeed with us the question of fineness does not affect the problem. My experience is that not only cattle, but also sheep, eat the New Zealand form greedily during the winter months and thrive upon it.

Disk Harrowing Lucerne.

The foremost method of cultivating alfalfa (lucerne) is with the disk harrow, one of the most excellent farm implements ever invented. Alfalfa sown in the fall (autumn) is almost invariably helped by disking the following spring, with the disks set quite straight so as not to cut the crowns but to split them. It is usually well to follow this disking with a tooth harrow, with its teeth set straight. Occasionally in a dry summer the disk may be used to great advantage after the second, and possibly the third, cutting also. Many disk their alfalfa fields every spring and some after each cutting; others do so only once in every two or three years owing to weather conditions and the conditions of the alfalfa. In some instances the common harrow is used instead of a disk. The disking has several beneficial effects. It splits and spreads the crowns, causing more, and consequently finer, stems to spring up, affording hay of the most

delightful quality easily cured; it loosens the soil about the crowns, conserves moisture, and destroys the weeds. There need be no fear of killing the plants if the disks and the harrow teeth are set straight and weighted, or otherwise adjusted to give direct and steady forward movement. As an implement for the cultivation and invigoration of an alfalfa field the disk harrow has no equal, and its frequent use is by those who know it best deemed quite indispensable.—F. D. COBURN ("The Book of Alfalfa").

Thorley's Almanac.

In connection with the notes which have appeared in recent issues in regard to the above, Messrs. R. Mason & Son, of Durban, Natal, write stating that they are joint South African agents for the almanac with Messrs. R. Wilson, Son & Co., of Capetown, and that they will be pleased to supply, as far as possible, copies of the almanac to all who have unsuccessfully applied to the Capetown agency, as they still have copies of the publication left.

"Journal of the South Indian Association."

We have received the January issue of the *Journal of the South Indian Association,* whish has several articles of value. Dr. C. A. Barber, D.Sc., F.L.S., the Madras Government Botanist, leads off with an interesting discussion of the influence of environment on plants. Dr. Barber summarises the main factors of the principal theories of evolution which hold the field at the present time, and presents concisely the reason why the obvious idea that the environment directly mechanically moulds living beings so as to adapt themselves to their conditions must be accepted with extreme caution. In an article on Chemical Industries, Dr. Harold H. Mann, D.Sc., the Principal of the Agricultural College, Poona, discusses the future of chemical and allied industries in the Bombay Presidency, and states that there are openings for very large development within the next few years. The *Journal* also includes the Presidential Address delivered to the Association, entitled "Some Economic Aspects of Geological Investigation", by Mr. V. S. Sambasiva Aiyar, B.Sc., L.C.E., F.G.S., Professor of Geology, Central College, Bangalore The notes and memoranda on economic and industrial subjects form interesting reading.

Scab: Its Nature and Treatment.

By A. G. DAVISON, Chief Inspector of Sheep (Cape).

(A Paper read before the Vryburg Farmers' Association.)

THERE is probably no question which has been so earnestly discussed among the farmers of this country, or that has caused such intense feeling, as well as differences of opinion, as the question of scab.

Unfortunately the disease has proved a source of irritation, not only to the miserable sheep which may have been attacked by the scab parasite, but also to many of the farmers who differ in opinion as regards the cause, nature, and treatment of the disease.

For more than twenty-three years a certain portion of the Cape Province, consisting of twenty-six divisions, has been under legislation dealing with scab, and since the 1st November, 1895, the whole of the Province has come under the operation of the Scab Act of 1894. Notwithstanding this, there are still at the present time many farmers who do not believe that scab can be eradicated. They admit that sheep can be cured of the disease, but argue that scab is certain to reappear with the first season of drought. Others attribute scab to poverty of the blood, bad water, dust, and various causes too numerous to mention. Questions are still asked by persons who are conversant with the investigations of the subject as to whether the scab is the cause of the parasite or the parasite is the cause of the scab. The investigations referred to have answered these questions, for it has been demonstrated in this, as well as in other countries, that scab can only be caused by the parasite, and that the treatment must consist in external application for the destruction of the mites and not internal remedies to purify the blood. Doubts and erroneous views of this description can only be dispelled by ocular demonstration and education, and if every stock owner who believes that scab is caused by a parasite and that the disease can be eradicated would set out as a teacher and preacher in his own immediate neighbourhood, I have little doubt that many converts would be made, and the number of those who are opposed to scab legislation considerably reduced.

I propose to divide my paper into three divisions:—

First.—The cause and history of scab.

Second.—The nature of the disease.

Third.—The treatment of scab and how to eradicate it.

CAUSE AND HISTORY OF SCAB.

In the first place it must be clearly understood that scab cannot be produced spontaneously out of dead matter. Science has proved spontaneous generation to be a fallacy. The advance of scientific knowledge has been slow though sure. Once, however, the conviction that spontaneous generation is a myth is forced home in the minds of men, the possibility of exterminating the parasite will appear feasible.

An impression has gained ground among some farmers that scab is hereditary, and that a lamb born from a scab-infected mother may

also be affected with the disease. This impression is, however, erroneous, for the parasite which causes scab lives on the external surface of the body and does not reach the womb. Lambs are occasionally born with white spots on their skin, due to absence of yolk on these particular places, and this has possibly given rise to the idea that scab is hereditary. The scab parasite is bred from father and mother like all other living things, and can be exterminated. When this conviction is generally accepted by farmers the conditions resulting will be such as to render the perpetuation of the scab parasite impossible.

Australia's Experience.

On the Australian continent there at one time existed a condition of affairs similar in many respects to that which we in this country have to contend against. Many farmers held most erroneous views on the question of scab, and at the same time maintained these opinions by obstructing the enforcement of the law by every means in their power. The Governments of the various Colonies, believing that scab could be eradicated, enforced the laws for the extermination of the disease with a firm hand, and they achieved the following results:—In Queensland scab was eradicated in 1864; in New South Wales in 1868; in South Australia in 1871; in Victoria in 1876; in Tasmania in 1879; and lastly in Western Australia on 26th May, 1898. Surely if other Colonies suffering from the same drawbacks as we do can effect results of this nature we can follow their example.

Ancient History.

Scab has been known from the earliest times. References to the disease are found in the earlier writings, including the Bible, where we find in Leviticus xxii, verse 22, the use of scabbed sheep forbidden in sacrifices. Livy speaks of a disease, scabies, so prevalent among sheep and cattle in the neighbourhood of Rome, in the year 424 B.C., that it was communicated to all the flocks in the country and eventually to the slaves. The Roman poet, Ovid, also speaks of a pestilence that prevailed in the island of Ageria, and describes the falling off of the wool of the sheep and their gradual wasting away. In England scab has been known for many centuries, and Fitzherbert describes "The pockes that appeare uppon the skyn of shepe and whereof wyll dye many". The disease is also alluded to by Chaucer and other writers of a later period, and evidence of its destructiveness is found in the records of Thomas of Walsingham and Stow. Laws were made in Britain with regard to scab as early as the reign of Howell the Good, of Wales, at the commencement of the eleventh century, when the disease was known as "claurey". In our country we know scab must have been considered by the early settlers as troublesome as well as a most destructive disease, and one for which no certain cure was known. In accordance with the measures of those times drastic precautions were adopted for effectually dealing with the disease, as will be seen by the following Placcaats, dated 1693 and 1740, which provide:—"That as heavy mortality has occurred among the sheep of the company, and as this has mainly been caused by scab, all servants of the company appointed as shepherds to depasture sheep shall be bound to at once warn the Landdrost or Master under whom

they serve as soon as any sheep for which they are responsible become affected with scab or any other contagious disease; and any one who shall be found to have shown carelessness in this respect shall be liable to a fine of 25 rix dollars; and further, that every company's servant being in loan to free man and herding the latter's sheep shall be bound on three successive days to warn his master whom he serves as soon as he sees a scabby sheep in the troop entrusted to his care, in order that the throat of every such sheep or all such sheep may be cut and further contagion prevented. And in case the master or masters shall fall short in this, he or they shall incur the said fine of 25 rix dollars."

Considering the provisions of the Placcaats adopted by the early settlers in 1693 and 1740, I hardly think any one to-day would be rash enough to describe our present legislation for the eradication of scab as harsh or severe.

NATURE OF THE DISEASE.

Secondly, as regards the nature of scab, there are many varieties of the parasite, but I think we need only deal with these with which we are familiar in this country. These varieties are the *Psoroptic*, *Sarcoptic*, and *Symbiotic*.

Sheep are liable to the attacks of the two first-mentioned varieties, but that most generally known among farmers is the *Psoroptic* variety. This parasite is one of the larger mites, and can be readily distinguished with the naked eye. The adult female is about one-fortieth of an inch long and one-sixtieth of an inch broad. The male is slightly smaller, being about one-fiftieth of an inch long and one-eightieth of an inch broad. The parasites are furnished with sharp mandibles, which are used not for burrowing (for the mite is always found on the surface, either on the skin or in the wool), but for piercing the skin of the animal to obtain their food. Their bites are followed by intense itching with irritation, and papules of a whitish colour are formed, from which there exudes a serous fluid, and this becoming dry and hardened, forms a yellow crust or scab. The pimples, though isolated at first, soon become confluent through the multiplication of the parasites. The inflammation raised by the constant rubbing and scratching, in the attempt of the animal to allay the irritation, causes a great amount of purulent fluid to exude, which upon drying increases the thickness of the crusts. The skin soon becomes too hardened for the mandibles of the parasites to penetrate, and the mites consequently forsake the centre and extend round the margin. Thus the spot of scab, unless checked, increases in size, and in time extends to all parts of the body.

The Life Cycle.

Experiments have proved that the female mite lays about fifteen to twenty-four eggs either on the skin or fastened on the wool near the skin; a six-legged larva is hatched, and these larvae will moult when three or four days old. After the first moult the fourth pair of legs appear, at which time the mites are two-thirds the size of the adult. When from seven to eight days old the mites are mature and ready to pair, several (three or four) days are allowed for pairing. After pairing a second moult takes place, followed immediately by a third moult, then eggs are laid and the adult parasite dies. Opinions differ

considerably respecting the period required for the eggs to incubate, which may probably be explained by the conditions under which the observations and experiments were made.

Some writers maintain that the larvae will appear in from three or four days after the eggs have been laid, while others again estimate the period of hatching at from six to seven days. Much must depend on the climatic conditions, for in this country I have known the egg of the parasite to be hatched in thirty-six hours after it was laid. Experiments carried out some years ago at Maitland showed that on the sixth day after three adult parasites had been placed on a clean sheep several larvae were observed on the infected spot. It will, however, be readily perceived that in favourable conditions the parasites can increase at an enormous rate, especially as the females outnumber the males in the proportion of two or even three to one.

Parasites Live Three Days Under Water.

As regards the vitality of the parasite, experiments have shown that when separated from its host the mite will not live for more than twenty or twenty-one days. Parasites which were taken from a sheep, placed in wool and kept in dry, loose manure, were all dead, save one, on the thirteenth day, and the sole survivor shared the same fate on the sixteenth day. In some respects the mites appear to be extremely tenacious of life, as the following example will show:—On the 12th April, 1899, I took some parasites from an infected sheep exposed for sale on the public market at Kimberley. Returning to Capetown on the 18th idem one of the mites was placed in a glass of water at 2 p.m. on the same day, and upon taking the parasite from the bottom of the glass at noon on the following day the mite was found to be alive and active. After keeping the parasite for about five minutes in the sun it was again placed in the water and only taken out at 3 p.m. on the 20th April, when it was still alive. The mite, after being replaced in the water, was examined at 11.30 a.m. on 22nd April, when it still showed signs of vitality. Thus this parasite, after having been starved for six days and immersed in water (with the exception of a few brief intervals) for a period of three days and twenty-one hours, was still alive, and would in all probability have been capable of causing scab had it been placed on a healthy sheep.

Next, as to the *Sarcoptic* scabbies. These parasites are much smaller than those of the *Psoroptic* variety and are almost invisible to the naked eye. They are found under the surface of the epidermis and live on the fluids of the sheep. This form of scab appears on parts of the body where wool is scarce, usually beginning about the nostrils and on the upper lip; it spreads in time to the cheeks, eyes, forehead, and under the jaws. In some cases it extends to the belly, front legs, knees, hocks, and pasterns. Fortunately this species of scab among sheep is rare in the country, and although it may have existed among flocks in certain parts of the Province for a long time, it was only identified in the year 1895, when some flocks of sheep were discovered with the disease in the neighbourhood of Fort Beaufort. Outbreaks of this scab have occurred in Albany, Humansdorp, King-williamstown, Murraysburg, and Willowmore. Experiments have been made in order to determine if the *Sarcoptic* parasite taken from a sheep would infect a common goat or vice versa. In the first case,

the results were established without any difficulty by taking part of the skin from an infected sheep and attaching it to a healthy goat which in turn contracted the scab, the papules being clearly visible on the fifth day, and continuing to spread until the larger portion of the body was covered with hard white scab.

The efforts made to transmit the parasites from the goat to the sheep have, however, on every occasion proved a failure.

The sarcoptes are parasites which burrow into the skin. In shape they are smaller than the psoroptes and of a less oval form, whilst the head is short and thick. On account of their burrowing habits, and the fact that the female deposits her ova in the furrows she has made, as well as by reason of the parts of the animal usually attacked, the disease is more difficult to cure than the psoroptic scab, and will only yield to continuous and systematic treatment.

Goats Affected.

Angora as well as common goats are subject to sarcoptic scab. The parasite first attacks that part of the skin which is free from hair, and then if unchecked spreads to all parts of the body, the skin becomes hardened, dry, cracked, and adherent, and the nose and lips tumified, until the unfortunate animal becomes encased in what might be termed a complete suit of armour; with this difference, that instead of protecting the body, the scab ultimately causes death.

Pigs, cattle, and horses are at times attacked by sarcoptic scab, and many outbreaks of the disease may be attributed to goats and sheep frequenting places in which such infected animals have slept.

Angora goats, besides suffering from sarcoptic scab, are also liable to be attacked by the symbiotic species. These parasites generally commence operations on the inside of the front and hind legs, thence the chest and abdomen, and then up the sides of the animal. They congregate in immense numbers, and may readily be observed with the naked eye on the margin of the infected spots. Their movements are rapid, and the males appear to be almost as numerous as the females.

THE TREATMENT AND CURE OF SCAB.

Thirdly.—As regards the treatment of scab and how it should be eradicated. One of the most important appliances on every farm on which small stock are grazed is the sheep-dipping tank. May I add here that every farmer should construct a tank on his own farm and not make use of the appliances on the adjoining place, for driving infected sheep to another farm for the purpose of dipping the flock is not only laborious but leads to the spread of the disease.

Round versus *Long Dipping Tanks.*

There are different forms of tanks, that of a long, narrow shape being generally used. The most suitable for the modern farmer is, however, the circular tank, constructed nearly in the form of a large soap pot. For the ordinary stock owner the following dimensions will be found useful, viz., diameter at top 4 ft. 9 in.; diameter 6 in. from the surface, 5 ft.; diameter 12 in. from the bottom, 3 ft. 6 in.; depth of the tank from 4 ft. 6 in. to 6 ft. The bottom of the tank should be gradually rounded off, and the whole lined with cement. The object

in building the tank with a slightly smaller diameter at the top than 6 in. below the surface is to prevent an overflow when sheep are placed in the water. A tank of the afore-mentioned dimensions would hold from 400 to 450 gallons of water, which should be sufficient for all ordinary requirements. The advantage of a circular, as compared with a long narrow, tank will be found in the thorough soaking of any animal treated in the first-mentioned tank. Each sheep placed in the water must swim round and round until released into the draining kraal. The action of swimming opens the fleece and allows the dipping mixture to penetrate to every part of the body. In the long narrow tank the animals have to be frequently turned over, and are continually crowding at the outlet, climbing one on top of the other in their efforts to escape.

The graduated capacity of the dipping tank must be accurately gauged and a rod prepared on which should be marked every 25 gallons of water placed in the tank.

The Dip and Dipping.

When selecting a sheep dip it is well to remember that two properties are essential in order to secure the most beneficial results. First, the preparation should prove a perfect cure; and, second, it should act as a preventive of reinfection. Having selected the dipping ingredients no mistake must be made as to the manner in which these are prepared, which should be strictly in accordance with the directions given, and wherever possible the preparation should be used in a warm state. Guess work must be avoided, for this is in a large measure accountable for many of the failures to cure scab. We now pass on to the actual dipping, and at this point I would remark that before placing any sheep in the tank every animal showing the least symptoms of infection should be caught and all the scabby parts thoroughly softened and broken up by hand with the aid of some of the dipping mixture taken from the tank. If any sheep are infected with sarcoptic scab these animals should receive the most careful treatment, especially when the head is affected. The handling of all scabby animals prior to dipping is most essential, for experience has proved that the eggs of the parasite, hidden under the hard covering of scab, may retain their vitality for many months, unless the dipping mixture is allowed to penetrate to every portion of the skin.

Proper Treatment.

When placing the sheep in the tank care must be taken that each sheep is caught in a proper manner, and neither dragged along the ground nor pulled to the tank by its hind leg. Such actions frequently causes ewes heavy in lamb to abort, and is at the same time responsible for other serious injuries. The sheep must be dropped—not thrown—into the water, and each animal when being immersed should be able to see where it is being placed. It is essential that every farmer should be provided with a sand glass, timed to one minute and a half, or, better still, two minutes, and no sheep should be permitted to leave the tank until the sand in the glass has run its course. If any sheep in the flock are in low condition, these animals should be dipped before the remainder of the flock, and at the same time assisted by hand to leave the tank. In cold weather, operations

should be commenced at an early hour, and all work suspended at noon in order that the fleeces of the sheep may dry before sunset.

The first dipping having been completed, the flock should be given a new kraal or sleeping place, and the old premises destroyed or enclosed with a substantial fence. Wherever possible fresh pasture is also advisable, though, owing to over-stocking, in many parts this cannot always be given.

The first dipping, if properly administered, only destroys the living parasites and does not injure the eggs of the mite, which will probably continue to hatch for some days after the operation.

The Second Dipping.

No doubt many of the larvae will die from the effects of the first dipping, as the fleece as well as the skin of the sheep would still be impregnated with the dipping mixture; still a considerable portion may survive, and in order to deal with these a second dipping must be administered within a certain period. The interval which should elapse between the two operations is a matter of opinion, and has been variously estimated at from ten to sixteen days. In this respect I consider that much must depend on the climatic conditions and the ingredients used for dipping, for a preparation which contains a considerable proportion of sulphur will probably carry with it more lasting effects than any other mixture.

Experience has shown that the second dipping should be carried out at an interval of from ten to fourteen days after the first operation, although in the cases I have mentioned there should be little or no danger if the second dipping is postponed to the sixteenth day.

Reinfection.

If dipping is carried out on the lines here laid down, and the stock kept away from the old kraals or other sources of infection, they should be cleansed, and will remain clean, unless the parasite is introduced from some other quarter. The stock and farm having been cleansed, it is of the greatest importance that every precaution should be taken to prevent reinfection. In this respect farmers cannot be too careful regarding the treatment of any small stock which may be brought to the farm. It is imperative that only clean sheep should be introduced, and that these should be thoroughly dipped, as a precautionary measure, before being mixed with the other stock on the place.

Treatment of Goats.

Angora as well as common goats require more detailed treatment, especially when the former are infected with sarcoptic scab, which, owing to the burrowing nature of the parasites, is more difficult to cure than the psoroptic variety. Before dipping, each animal that is infected with scab should be paint-marked, and thus easily distinguished among the flock. The infected parts of the goats so marked must be thoroughly scraped and rubbed with a warm preparation of dip until the whole skin is quite soft. Special care must be devoted to the heads of the animals and all particles of scab rubbed away.

Pure lard oil is an excellent preparation to use for rubbing into and softening the skin, and each of the paint-marked goats should be treated in this manner prior to being placed in the tank.

Dipping may then take place, every animal in the flock being thoroughly soaked in the mixture prepared, which will penetrate all the more readily if used at blood heat, or as hot as the goats can bear it without injury. Between the first and second dipping the infected goats may again be treated with lard oil, and after the second dipping no further trouble should be experienced. The directions given for clean and healthy sleeping places in the case of dipped sheep should be followed when the treatment of goats is concerned, and at the same time fresh pasture should whenever possible be provided.

Old Kraals Infectious for Three Years.

You will doubtless have remarked the emphasis which I have placed on the necessity for providing new kraals and sleeping places for infected stock after the first dipping, and it will be as well to explain my reasons for being so emphatic on this matter.

On the 11th August, 1906, an infected kraal, situated in the District of Jansenville, was enclosed with barbed wire and netting and divided into five sections with the object of ascertaining for what period such a kraal could be considered a source of infection. One of the five sections was opened in March, 1907, and 100 clean goats allowed to occupy the kraal every night. Within five weeks scab broke out, whilst the remainder of the flock from which the goats had been selected proved on examination to be perfectly clean. On the 10th August, 1909, or three years from the date on which the kraal had been enclosed, another section was opened and 100 goats taken from a flock numbering 780 (which had never had scab) were allowed to sleep in the kraal every night. On the 30th September following scab appeared among the experimental goats. The rest of the flock in the meantime remaining clean. On the 3rd November last a third section of the said kraal was opened and 100 clean goats placed in it. The last examination of these goats was made at the commencement of the present month, when the flock was still free from scab. The experiment has therefore shown that for three years at least a kraal in which infected stock has been kept can be said to constitute a source of danger and infection.

The question may be asked how it is possible for infection to exist for such a long period in a heap of manure, when, as has already been shown, the life of the parasite is measured by days. The only conclusion arrived at is that the ova of the mite retain their vitality for an indefinite time, and only incubate when favourable conditions, such as heat and moisture, are present. I may add that as a general rule infection is only produced when the manure in the kraal is disturbed and the lower layers brought to the surface.

Commonplace Matter.

It may be thought that I have dealt with very commonplace matter, and that there is nothing original in my method of treating the vexed question of scab. I grant all this, and at the same time apologize for taking up time with such ordinary matters with which all may be more or less conversant. Nevertheless, allowing that my subject has been worn threadbare, it may be of use to consider why, when most people are acquainted with the law and treatment of scab, the disease has not been eradicated years ago in the Province proper.

Neglect of Detail.

My answer to this question would be that failure to exterminate the scab parasite is mainly due to the neglect of detail and the ordinary precautions which should be adopted in the treatment of the disease. In the Province proper, notwithstanding the many years in which the Scab Acts have been in operation, I am fully convinced that 80 per cent. of the stock owners do not treat their flocks in a systematic or thorough manner.

Even when the dipping ingredients are properly prepared (which precaution is frequently neglected) the stock are too often hurried in and out of the tank, the main object apparently being to dip as many sheep in the course of the day's work as possible, without the due regard to the manner in which the stock are dipped. In the majority of cases such sheep are returned to the infected kraals, sleeping place, and pasture, and the owner then blames everything save his own neglect for failing to effect a cure.

If a thing is worth doing it is worth doing well, and the neglect of detail often leads the farmer to ruin. If the scab parasite is to be exterminated in our country one determined effort is necessary. This effort may at the time prove expensive, but ultimately it would be the most economical. A short and decisive campaign against the common enemy, although it may involve a heavy expenditure whilst it lasts, is preferable to a long and protracted warfare, the results of which may be indefinitely postponed.

Scab is a disease not difficult to cure or eradicate; an accurate knowledge of the cause, as well as the necessary treatment required (with due regard to detail), are all that are needful to secure this result.

Cause of Past Failure.

One reason why we have failed to eradicate the disease in the twenty-six divisions referred to at the commencement of this paper and which have been under the operation of a Scab Act since 1st July, 1887, is because the inspector has never had power to deal with or treat infected premises. He may under certain conditions clean the scabby stock, but the kraals and premises—the true source of infection, and which act as incubators for the propagation of the disease—are "sanctuaries" over which the inspector has no control, unless the necessary permission is given by the owner.

10,000,000 *Clean Sheep.*

In 1897 the percentage of infected stock in the part I have referred to amounted to over 3 per cent. At the close of last year this had been reduced to a little over 1 per cent. In some of these districts the farms which were infected during the operation of the scab laws of 1886 and 1888 are still giving the inspectors trouble at the present time. Had our staff the power to treat the infected stock and kraals whenever an outbreak of disease occurred, we would within twelve months be in a position to return at least 10,000,000 sheep as free from scab.

The Block System.

I have strongly advocated the cleansing of stock in the country in blocks or groups of districts, and I am more than ever convinced that

this system will prove the most effectual, and at the same time the most economical.

If our present laws are amended and the power given to each inspector throughout the country to cleanse the flocks in his own area or district, I fear the work of exterminating the parasite will be considerably delayed owing to the difficulty we are certain to experience in securing competent men to undertake the duties. Some of the officers at present serving on our staff would not be qualified for the work, and the question arises where could competent inspectors be obtained, unless greater inducements are offered for capable men to seek employment.

The great advantage to be gained by the adoption of the block system would be that the staff employed in the first area attacked could be transferred to the second block when their services were no longer required in those districts in which the flocks had been cleansed. It would be necessary to leave behind a certain number of men to deal with any outbreaks which might possibly occur and to guard against the introduction of stock from outside the area. As the work in each block was completed the next taken in hand might be larger in extent, as the number of trained inspectors would always be on the increase. Our advance might be slow, but at the same time would be certain and sure.

Protection for Clean Farms.

Whatever may be the method adopted by our legislature for the eradication of scab in the future, one matter is of paramount importance, and this is, measures must be embodied in the law to protect farmers who have cleansed their stock and ground. Our present laws afford no protection whatever to such men, and it is surprising that, considering the number of infected stock which are continually being removed from one part to another, so many of the flocks in the country have remained clean for such long periods.

During last year over 66 per cent. of the flocks in the Province proper were reported as having remained free from scab for twelve months or longer. Within that period more than 770 flocks, containing about half a million sheep and goats, were in an infected state, with permits issued by our sheep inspectors in terms of the Scab Act of 1894.

Time after time the stock in certain districts have been free from scab, only to be reinfected by an introduction of a diseased flock. As recently as last week a communication was received from a certain farmer, whose sheep had been clean for the past four years, asking for protection, as a large flock of infected sheep, removed from an adjoining district (with the permission of the inspector), had been crossing his farm for thirty-six hours or more. It is cases of this description which dishearten farmers as well as sheep inspectors, and which it is hoped future legislation will render impossible.

Competent Men Wanted.

I have already remarked that I anticipate that considerable difficulty will be experienced in securing the services of competent men to act as sheep inspectors. Many may think that I am unduly pessimistic on this point, but nevertheless it is a fact that only a

fraction of the men who have served at one time or another on our staff during the past three and twenty years have turned out first-class officers.

The mere fact that a man has been engaged in farming for a certain number of years, is conversant with the provisions of the law he has to administer, as well as acquainted with the nature and treatment of scab—although certainly strong recommendations in his favour—are after all no guarantee that he will make a first-class official.

The inspector must be a man who holds more advanced views and be possessed of more practical experience in the treatment of scab than the general class of farmer among whom he has to work. He must be possessed of unlimited tact and patience, and yet at the same time the quality of firmness must not be lacking. In a word, he must be able to help and lead as well as teach, and only drive in extreme cases.

Whatever may be the nature of the machinery we have to use in the eradication of scab in the future, we must certainly require skilled workmen, for I maintain that in order to secure the most effective results all cleansing of stock and premises should be carried out by or under the supervision of the officers employed.

With adequate protection provided for clean farms and districts, the removal of infected stock prohibited, and the provision for heavier penalties for failure to report outbreaks of disease and for removing scabby sheep, I can see no reason why within a few years scab should not be an unknown quantity in this country.

The Merino.

By C. MALLINSON, Flockmaster and Wool Expert (Transvaal).

(Lecture delivered at the Bloemfontein Agricultural Show.)

MR. MALLINSON said he would try to go into the subject of sheep breeding as he understood it from practical experience. The very foundation of sheep breeding was constitution. Now, what was constitution? In concrete it meant good quarters. Starting with the head of the merino, the lecturer said he liked a sheep with a short, thick neck, not very long in the face, having a thick bull-neck, head well stuck on to the shoulders. If a ram, he must have a good front and be wide in the chest. He must be straight on the back, wide across the shoulders, deep and round in girth, hindquarters full, and standing on four straight legs. The ewe should also have well-rounded ribs and be deep in girth.

A number of farmers thought that if they gave £500 for a ram they were going to make something out of nothing, which they could not do. In regard to constitution a good deal more depended upon the dam than people thought. There lay one of the grand secrets in building up the constitution. If there were plenty of room inside the dam to manufacture a lamb, and the ram was built in a similar way to the ewe, then, as sure as the sun rose each day, a lamb with a good constitution would result. He took it, of course, that they were all sheep breeders and knew how to feed ewes when in lamb. If they starved a pregnant ewe then he cared not how good she might be in constitution, it had a tendency to pull her down.

If they wanted constitution they must look after the ewes as well as the rams. It took two to make a bargain, whether good or bad. If either the dam or the sire were bad disappointment must follow. If a man bought a racing mare and put her to a draught horse, in the hopes of winning the Johannesburg handicap with the progeny, he would not expect to succeed, and it was the same with a sheep. If certain rams were mated with certain ewes to gain a certain point one could expect to gain it. A sheep built the way he had described, more like a nuggety draught horse than a racehorse, would more easily preserve the type than if a slab-sided, lanky-looking thing were admitted, the kind he would not give 5s. for. He spoke as a practical sheep farmer who had worked himself up from the bottom rung of the ladder.

Mr. Mallinson (continuing) said:—" If you have constitution, which is the foundation of sheep breeding, the rest is as you make it. The wool that grows on the sheep's back is what you make it by judicious mating and feeding." Did they require more yolk, greater length, or density, or did they want to kill a fault in their sheep, then they must mate up for that particular object. " But for heaven's sake," added the lecturer, " don't go outside your own sheep's family

to do it. If you have Tasmanian sheep stick to them, if Wanganella stick to them; and, if there is any alteration to be made, the climatic conditions will do it for you. If you want a nice serrated wool, look to it when you are classing your young ewes; bring them to the kraal every year and class them, but don't breed from them too young or you will collapse." What was wanted was a good carcass. with as much wool as the sheep could carry and earn its living. He farmed sheep for money, not for fun.

WOOL.

He liked to see a sheep with wool on him of the right kind. What was the right kind? He did not know if they knew the sort of wool that would make 60's top. The 60's warp wool must be longer and stronger than the 60's weft wool. The strength of the cloth must be in the foundation or warp, or the first time they fell their trousers would burst at the knees. The warp wool was *the* wool, and it fetched a penny a pound more than weft wool. When they were mating up they should mate up for a good 60's top robust wool. It had always been his experience that a strong, pure-bred robust wool would stand the pinch better than a finer wool. It was far better to keep on the robust side. The lecturer said:—" It is a very easy thing in this country to breed a short, fine wool. Any farmer can do it almost as well as an expert, because the country will do it for him. Good 60's top robust wool must be truly serrated from the butt to the tip. You need not bother about the fine fibres. You can fight it all your life, and with all your energy, and still it will come. Try to get 60's top, and you will get strong wool, and fine wool also. If you want robust wool, how can you get it if you have not been breeding for it? If you have happened to get a robust-woolled ram it has only been a fluke, and where would a ram so got derive his prepotency from to produce strong-woolled stock? In order to keep up 60's top you must aim at breeding a robust-woolled sheep."

HOW I WOULD MANAGE A STUD FLOCK.

Proceeding, the lecturer said that if he were a stud-breeder—using the term " stud-breeder " in the true sense, as describing the man who bred his own stud—this was how he would manage a stud flock. Suppose a man had 500 good stud ewes. Some people had the idea that all a man to-day had to do was to turn a number of rams into those ewes and all would be well. He said all would not be well. He would divide the 500 ewes up into four or five families. As near as possible he would get a fine-woolled family, a robust-woolled family, a dense-woolled family, and a long-woolled family. He took it that their farms were so fenced that these families could be kept separately. When the progeny came he would look for something good. If he did not get one good ram from the four families there must be something wrong with the mating. Provided he did get one good young ram he would give him twenty to thirty ewes. There would then be five families going. By and by the breeder could fetch a ram from one family or another as needed, which was just as good as going ten thousand miles and paying £500 for a ram, because then the farmer knew his ram, knew how he was bred, and could with a greater amount of certainty say, " I am going to have the best ram and best ewes I

ever had in my life." When classing their sheep they should observe what such and such a ram was doing, what were the faults of his progeny, and next time mate accordingly. When mating, mate up to kill the faults: they would never produce a perfect sheep, but they should aim at getting as near as possible to the ideal. If sheep breeding were worth anything at all, it was worth going in for thoroughly with coats off. If not so inclined, a man had better give the business up. He loved a sheep and the study of sheep. There was no more fascinating study in the world. Sheep breeding was unlike cattle breeding and horse breeding, in that they had not to consider carcass only, but carcass as well as wool. If the breeder put the right kind of wool on a sheep's back it would realize 9d. to 1s. per lb. If it was poor stuff it would not realize half that sum. It required no more care and attention to look after a good sheep than a bad one. Why, therefore, should men farm bad sheep?

Finally, he would like to mention one other point. In mating up for strong wool they would get more good rams than ewes, and in mating up for fine wool more good ewes than rams. This had been his experience.

QUESTIONS ASKED AT THE CLOSE OF THE LECTURE.

Several questions were asked, and the first related to folds. The lecturer explained that, as soon as breeders commenced to thicken up the wool, folds began to appear. In breeding for folds the skin got bigger than the body: this skin got away from the flesh, and the wool on those points became "wild" or hairy. Folds did not mean density. He had examined very wrinkly sheep, and they had nearly a quarter of an inch of bare skin. He did not call that density. The great point in breeding up for density was to know when to stop. The constitution must be lifted at the same time or something would break.

In reply to Mr. Arnold, he said it was not necessary to breed for folds when aiming at density. If they bred for folds the skin would get away from the flesh, and the wool that grew on the parts away from the flesh would get wild. It was not the same kind of wool that grew on the skin that was tight on the flesh. A great point in sheep breeding was an even fleece, but if they aimed at too much density with folds there would be a tendency to unevenness. At the same time he (Mr. Mallinson) admitted that he liked a ram with a few folds.

Mr. Arnold asked whether, if Mr. Mallinson saw a sheep that was fine otherwise but carried a little hairy wool on the wrinkles, he would say it was detrimental to breed from such a ram?

Mr. Mallinson replied, "Yes, if I were a sheep breeder I would try and get away from it as much as I could." The reply was interesting, because—as Mr. Arnold afterwards remarked—he had seen this wild wool on champion sheep at the Sydney shows. Was it an actual fault if the teeth of a ram were over a little, as in the case of the sheep in the ring?

Mr. Mallinson replied that it was a slight fault in this case, but if the sheep were put on to gravelly country his teeth would soon wear level. Evidently the ram's teeth had not interfered with his feeding, as he was doing well.

Was this fault hereditary? was the next question.

Mr. Mallinson said it was an important question, and he could only reply that he knew the family the sheep came from, and it was

not hereditary there. At the same time he would watch it that the ewes set aside for such a ram had not the same fault. As to the ram in the ring, if he fancied him in other ways, his teeth would not prevent him from making the purchase. If his teeth were extracted it would be found that his upper and lower jaws were perfect.

What comment had Mr. Mallinson to make that the Government stud sheep in the ring had no wool below the knee? was the next question.

The lecturer attached no importance to it at all. He wanted wool worth 1s. per lb. off the sheep's back, and not the short stuff off his legs worth 2d.

A breeder present was evidently not satisfied with this answer, and asked, "If you had two rams, equal in other respects, would you choose the ram with plenty of wool below the knee or the one with very little?"

Mr. Mallinson said he would not express any preference. If they were good rams he would use either. When a man stuck out for such points he became a faddist.

In reply to another question, Mr. Mallinson said he did not trouble whether a ram had wool on his purse as long as he had plenty of good wool on his back.

Mr. W. D. Hockley moved a vote of thanks to Mr. Mallinson, not only for the interesting lecture, but also for the painstaking manner in which he had replied to the questions. It had been the best half hour he had enjoyed for many a day. If the Free State showed more improvement at the next show it would be partly due to Mr. Mallinson. He felt sure he was voting the sentiments of his Cape friends in moving this resolution. Mr. Steyn seconded, and it was carried with acclamation.

The Advancement of the Poultry Industry in South Africa.

THOUGHTS ON DIFFERENT SUBJECTS.

By FRED. T. HOBBS, 24 Second Avenue, Kenilworth, Kimberley.

Laying Competitions.—This subject is to me one of very great importance, as I realize that to make people understand the enormous value of poultry to the country it is absolutely necessary to prove by public demonstration their valuable utility qualities, and I thus consider that Laying Competitions should be held in various parts of our united Colonies as object lessons so as to prove what can be done by, (1) Systematic Breeding; (2) Systematic Feeding; and (3) Systematic Management.

(1) *Breeding.*—Breeding of poultry to be carried out properly, that is to say, for the creation of Stud Stock so to speak, can only be considered on the same lines as all other classes of stock. Thus it is absolutely necessary that the records of individual hens be kept, as great variations often exist even in a small pen of birds, and it will be noticed at all competitions that the eggs scored by the different individuals vary very must, likewise the different birds lay various sized eggs, and also certain of them lay regularly all the year round, whilst others lay heavily during certain months and none at all during others.

To a Breeder the knowledge of each of these differences is of great value in creating pedigrees and assisting in future breeding. Thus at a competition the regular performances of each individual should be recorded.

(2) *Feeding.*—Feeding is of great importance, especially when birds are in confinement.

Climate and the various seasons of the year have to be considered.

A knowledge of the analysis of foods is necessary, so as to blend the various kinds, and thus make a combination containing suitable ingredients which will provide nourishment to produce eggs, keep the body in good condition, and at the same time give the digestive organs sufficient exercise to keep them in a state of health.

It is also necessary to feed birds according to their size and variety, and the actual amount of food varies according to temperature, condition of fowl (namely, whether in full lay, moulting, broody, etc.). It is impossible to lay down any hard and fast rule, and it can only be decided upon by the man in charge, who should thus be an expert.

(3) *Management.*—To make Competitions successful and to be of the value to the Country and breeders that they should be, it is absolutely necessary that the man in charge thoroughly understands poultry, that he be reliable and honest, and that he receive a fair salary, as the importance of the work to the Country is enormous, and thus the best men possible should be obtained; the detail work of taking records needs

accuracy to be of value, and without proper management the laying competitions will do more harm than good.

Awarding of Prizes.—The awarding of prizes should be based:—

1st, On the value of eggs laid (not necessarily the value that the Controllers of the Competition obtain for the eggs, but the current weekly value of eggs as sold on the public market at the centre or town nearest the Competition). Thus it will be found that birds laying eggs from 15th February to 30th June bring in a better return than those laying heavily during the Spring months, and not so well during the months above mentioned.

2nd, The size and weight of eggs should count, the average weight being taken at 1½ lb. to the dozen eggs.

3rd, The external, or plumage, and size and shape of bird ought also to be considered, as these are the only points a buyer can go by when purchasing, and it should be possible in process of time to create strains of birds that can win on the show-bench, and be recognized as layers at a glance, the same being of good plumage, shape, size, and vigour.

4th, Weight should also count, as a breed that provides a good table bird and is also capable of producing good layers is really the most valuable, as the young surplus cockerels will always realize a good price, and the old hens when fat can generally readily be sold.

Taking therefore all things into consideration, I would suggest that points be given as under:—

Number and value of eggs	40
Weight of eggs	20
Weight of Bird	20
Plumage and condition	20

The points for plumage should be given at commencement of competition, as towards the close most birds are in heavy moult and it would be next to impossible to give a fair judgment.

The weight of birds should be taken both at the commencement and finish of the competition, both to be considered.

The English Poultry Club standard to be taken as the basis to work on for the different breeds, both for plumage and weight, except in specified American breeds, when the American standard should be used.

Time of starting competitions.—Generally speaking the best breeding season ranges from June to October, and it is recognized that heavy breeds should lay at about eight to nine months old, and light breeds six to seven months. It is also recognized that during the first season the pullets lay best; thus if competitions start on 1st April, or 1st May, the birds should be in the pink of condition. If started later, many will have already laid considerable number of eggs in breeders' yards, and the moving to the competition pens will check and severely handicap them.

Government Supervision.—For the satisfaction of all competitors, and the breeders throughout our Colonies, it is desirable that Government Officials inspect and report on the management of the competition from time to time.

Agricultural Shows.—Laying competitions started in various centres would do much more good than the poor display of inferior birds so often seen in the Country Districts. They really do harm.

At a laying competition a Farmer can see the birds, and see what they have actually laid in a given time under certain conditions, and this will do more good in encouraging the egg production than any other method, but the competition as before stated must be carried out in a satisfactory manner.

Poultry section of Agricultural Shows.—Prizes should be awarded according to the English Standards except in specially-mentioned American varieties, and the weight of birds as given in standards should always be taken into consideration; too much or too little according to breeds are both faults.

Breeding records.—Breeders of stud stock should be able to give details of pedigree of indivdual birds, and it should be recognized that a male bird, bred from a special hen with a good laying record, and a sire the son of a good layer, both of whose pedigrees can be traced for several generations, is of very great value; but it must not be forgotten that egg laying is not the only thing to study, as vigour, reproductive power, size, and feather must be considered, or weakness is bound to come, and eventual failure.

Breeding.—The art of breeding is very fascinating, and is, as I before stated, the same for all classes of stock, continual study of the blending of various qualities to produce other qualities, yet taking care to try and prevent the loss of other qualities already established.

It is absolutely necessary that external qualities be considered in conjunction with internal, both are necessary, and as with animals so with poultry, if external points such as feather, size, etc., are neglected deterioration is bound to set in, and likewise on the other hand if the egg-laying properties are forgotten, failure is sure to come.

Change of blood as it is termed is often the cause of failure, and it is possible to breed for many years without introducing new stock, provided that stamina is always watched, and birds showing any weakness, no matter of what description, are not included in the breeding stock.

As a general rule is is quite unnecessary to import stock now, there are grand birds in the country, and all that is needed is careful and systematic breeding.

The scope for careful breeders with pluck and perseverance to overcome difficulties, and who will make breeding a study, is enormous, there is pleasure and profit to be obtained, and with the general progress of the country, I look forward to the future of the Poultry industry with keen interest.

Actinomycosis.

By WALTER JOWETT, F.R.C.V.S., Veterinary Department, Capetown.

THE particular case illustrated in the accompanying photographs was brought to the notice of the writer by the sanitary authorities of a certain district in the vicinity of Capetown, it being suspected by them that the animal, a cow, was suffering from "cancer of the jaw".

On examination it was at once apparent that the cow was not the subject of "cancer" in any form, at any rate not of the jaw or head—we had here a typical case of the disease known as actinomycosis.

The photographs (figs. 1 and 2) illustrate the appearance presented by the animal. Both branches of the lower jaw were extensively involved in the diseased process, they as well as the soft tissues covering them being very much thickened and enlarged, and, as shown in the illustration, there were a number of fistulous sinuses leading from the surface of the thickened skin into the interior of the diseased bone. From several of the sinuses exuded a small quantity of thick yellowish pus ("matter") which, when carefully examined, was found to contain a number of minute pinhead-like grains of a yellowish gray colour. In addition to these "open" sinuses were also a number of well marked scars all depressed below the surface of the surrounding thickened skin; evidently these marked the site of old sinuses which had undergone the process of healing.

As one would expect from the localization of the disease in this case, considerable difficulty in mastication was manifest, but this notwithstanding, the animal was in fair condition, the owner having apparently been at considerable pains to keep his cow supplied with a sufficient quantity of cut, soft, and easily masticated food.

It was, of course, evident that the disease was of long standing, but the owner was unable or unwilling to inform us exactly since when he had noticed that anything was amiss with his animal.

Treatment being obviously out of the question, he was advised to have the cow slaughtered, and to this course consent was finally given, the head being then obtained by the writer for the purpose of further examination.

On sawing through the diseased bony tissue of the lower jaw, the latter was found to consist of a tumour-like mass built up of a coarse framework of bone, something like a sponge, comprising within its meshes fibrous tissue more or less dense, and enclosing at several points purulent material containing the actinomyces granules previously referred to. From the interior of the diseased jaw-bone a number of channels led to the exterior, these opening on the surface of the enormously thickened skin as the sinuses already mentioned. The molar (grinding) teeth in the lower jaw were loosened; some of them, in fact, had been shed.

The diagnosis actinomycosis was confirmed by microscopical examination, and portions of the altered tissue were prepared for the purpose of sectioning and further microscopical study.

Figures 3 and 4 illustrate the appearance presented by sections of such material as viewed through the microscope with a magnification of about 70. In figure 3 it will be seen that two colonies of the organism known as the actinomyces (the causal agent of the disease) are present. Surrounding these are a number of polynuclear leucocytes with a few flattened epithelioid cells and an occasional multinucleated giant cell, whilst surrounding the whole and forming a framework is fairly dense fibrous tissue. In figure 4 one larger, but otherwise similar, colony of the organism is shown. Figure 5 represents a small portion of the edge of one of these colonies magnified about seven hundred times. The characteristic club-like elements radiating from the centre of the fungus (actinomyces) are here clearly shown.

In this particular case, it may be mentioned, the disease was strictly localized to the lower jaw-bones and the soft tissues covering them. When examined after slaughter, the rest of the carcass was quite healthy; in not one of the remaining organs of the body was a sign of disease apparent.

It would seem that actinomycosis is a somewhat rare disease in South Africa. Mr. Borthwick (Chief Veterinary Surgeon of the Cape Province) states that he has met with a few isolated cases in cattle, mostly in the Midland districts of the Cape (Karroo). The members of the Cape Veterinary Staff also have seen cases of this disease in cattle from time to time. The case quoted in the foregoing note was encountered on the Cape Flats near Capetown.

For the benefit of those interested in the subject, a brief description of the disease is here given:—

Synonyms.—Actinomycosis, "Ray fungus disease", "lumpy jaw", "big jaw", "wooden tongue", etc.

Cause of the Disease.—The disease is caused by a specific micro-organism technically known as the *Streptothrix bovis communis*, or *Streptothrix actinomyces*, or merely as the actinomyces. As seen in the tissues, the organism appears in the form of a rosette or like the head of a daisy, a number of club-like elements radiating from a central mass, the latter being composed of felted filaments and spores. From this appearance the organism is sometimes termed the "ray fungus".

Outside the animal body the actinomyces occurs on grasses and forage, on the awns of barley sometimes, as well as on the grains of many other cereals, oats, wheat, etc. It is no doubt principally by means of such contaminated food and bedding that the domesticated animals become infected. When it gains access to the mouth, the actinomyces organism may penetrate between the teeth or into slight abrasions or wounds of the tongue, gums, or lining membrane of the throat and mouth—these, of course, may be produced by injuries inflicted by spicules of corn, or by thorns contained in the food as well as by other agencies. When carious teeth are present, or when the milk teeth are in process of being shed, a ready means of access for the parasite is provided. Occasionally the organism may be introduced by bedding, etc., into wounds and slight abrasions on the skin covering various parts of the body. The udder of cows and

swine (sows) are occasionally infected in this way; this is readily understood when one takes into consideration the delicate nature of the skin covering this organ and its liability to be injured and to be brought into contact with the ground and bedding. In some cases the organism has gained access to the scrotum of horses after castration; here again the mischief may be ascribed to bedding on which the actinomyces are present having been brought in contact with the operation wound.

Animals susceptible.—Cattle are the main subjects of this malady, but it occurs also in other animals, sows, horses, and occasionally in man. Cases of actinomycosis have been recorded in sheep and dogs, as well as in elephants and deer; in such animals, however, the disease is very rare.

Symptoms of the Disease.—We have already described the disease as occurring in the jaw-bones of a cow—and this is rather a common site in cattle—it is, therefore, unnecessary to refer further to actinomycosis of the bony structures.

Another common site of actinomycosis in cattle is the tongue. When this organ is affected it becomes enlarged and, sooner or later, acquires a wooden hardness from the large amount of inflammatory tissue formed in response to the irritation excited in the tissues by the parasite. Such cases are popularly known as "wooden tongue". By carefully examining an organ so affected, small nodules and superficial erosions can generally be detected on the surface; these may be few or many—usually they are not very numerous. The erosions have a firm leathery base in which close observation will reveal the presence of actinomycotic granule or foci. They are thus distinguished from other similar lesions of the tongue caused by other agencies. The enlargement, hardness, and, may be, deformity of the tongue, as one would expect, occasions the animal more or less difficulty in feeding, hence some wasting and emaciation (of the body) may accompany, or rather result, from this condition.

Still another common site of the disease in cattle is the throat region, often near the angle of the jaw externally, whilst actinomycotic lesions occur not infrequently also in the interior of the throat (pharynx). In this region the disease usually manifests itself by the formation of somewhat firm mushroom-like or pedunculated growths known technically as actinomycomata. These growths vary in size; they may be only as large as pigeons' eggs, or, as is frequently the case, they may attain the dimensions of a fair-sized orange or be even larger than this. Such growths in the throat are liable to interfere with swallowing and breathing. They may be composed of firm and well-formed fibrous tissue or, as is sometimes the case, they may be more granular looking and cellular. Occasionally it is possible to detect the small characteristic actinomycotic nodules in the substance of these growths by the unaided vision, but, on the other hand, it is often only possible to learn the true nature by microscopical examination. Suppuration (the formation of matter) in connection with these growths is not usual in the case of cattle, in fact suppuration in connection with actinomycotic lesions is by no means common in the lower domesticated animals. The tendency in cattle in this disease is to the formation of fibrous tissue. Still, abscesses do occasionally form in actinomycotic lesions even in these animals (and perhaps slightly more frequently in the case of the pig).

In this event one can detect the presence of the actinomyces granules in the pus if one examine it closely. In actinomycosis of bones, as occurred in the case quoted, pus formation is more often in evidence.

Needless to state many other agencies in addition to the actinomyces organism may produce growths and abscesses somewhat resembling those here described. In all cases of doubt the only method of verifying the diagnosis is the discovery of the causal agent (the micro-parasite) by microscopical examination.

The udder is affected by this disease perhaps more frequently than is generally supposed. In actinomycosis of the udder one or more quarters may be affected and the organ may be enlarged, firm, hard, and lumpy, containing a number of nodular masses in its substance. Such nodules may, in some cases, show soft foci in their centres. Actinomycosis of the udder in the cow is liable to be mistaken for tuberculosis of the same organ. The differentiation of the two diseases as a matter of fact can often only satisfactorily be undertaken by an expert (a duly qualified veterinary surgeon), consequently it is unnecessary to discuss the subject further in this place.

The lungs are sometimes, though rarely, affected with actinomycosis; other organs still less frequently.

In actinomycosis the lymphatic glands ("kernels") in connection with an affected organ are sometimes, although not usually, involved in the diseased process. In this respect the disease differs from tuberculosis and certain other infections in which the lymphatic glands related to an infected organ are invariably also affected by the diseased process—sometimes, indeed, in these diseases pronounced changes are apparent in the lymph glands when it is impossible to detect the presence of lesions in other organs and tissues of the body. In the case of actinomycosis affecting the lymph glands, although the latter may be enlarged and firm, there is no caseation, and suppuration is rarely in evidence. Careful examination of such glands will generally reveal the presence of small yellow or grey actinomycotic nodules or granules embedded in their substance.

Wherever the causal agent of the disease penetrates into the body, there it acts as an irritant, giving rise to the formation of the characteristic actinomycotic nodules and to a chronic inflammatory process attended with the formation locally of much fibrous tissue. Sometimes, though as already pointed out not usually in the case of cattle, pus ("matter") may also be formed.

Course of the Disease.—This is invariably chronic, or very chronic. The disease usually remains localized, showing little tendency to spread to organs other than those primarily affected. In some few instances it has been known to spread and even to become generalized; such cases, however, are extremely rare.

Treatment.—The medicinal treatment of actinomycotic lesions of the soft tissues is frequently successful, especially so if undertaken when the disease is not very far advanced, but when the bones are extensively affected, treatment by means of the administration of drugs is not likely to be of much practical benefit.

Pedunculated actinomycotic growths of the head or elsewhere, if situated in an accessible region, may be dealt with surgically, but this course can be adopted only by the expert.

Iodine and iodide of potassium are the drugs used in the treatment of actinomycosis. The drug last named may be administered in the drinking water, and should be given in full dosage—2 to 3 drams daily—until symptoms of iodism are produced (symptoms of catarrh, weeping, scurvy coats, loss of appetite, etc.), when the administration of the drug must cease for some days or the doses given be materially reduced. The administration of iodine internally may be accompanied with benefit by the local application of the same drug to the diseased areas, either in the form of the tincture, ointment, or as a watery solution.

Iodine is the one drug capable of yielding successful results in those cases of the disease which are amenable to treatment—old standing cases or those in which the bones are extensively affected are not, however, included in this category.

Prevention.—The disease actinomycosis is inoculable rather than contagious. Healthy animals may remain in close contact with those extensively diseased and yet not contract the malady. The manner in which animals become infected with actinomycosis is, as we have previously stated, by the entrance of the causal organism into their bodies by the agency of grain or forage or by the inoculation of the parasite into wounds of the skin by bedding and similar material. Transmission of the disease from animal to animal direct, or from the lower animals to man, rarely if ever happens; indeed, one authority has advanced the theory that the "ray fungus" (actinomyces) has a pathogenic effect only in that stage of its development which is connected with the awns of grain, and considers that its power of transmission to a fresh animal host is lost as soon as it has entered the animal body on account of having undergone some form of involution therein.

Still, the possibility of the transmission of the micro-parasite from animal to animal cannot be completely ignored since the disease has been produced experimentally in animals by inoculation in a few instances. In practice, however, under natural conditions this rarely if ever happens, and where a number of animals become infected with the malady at the one time it is more likely that they have acquired the infection in the one way, that is by means of foodstuffs which harbour the causal parasite.

Sanitary Aspect.—Whether the carcass of an animal the subject of actinomycosis should be utilized for food purposes depends upon several factors. Much depends upon the extent of the diseased process and the condition of the affected animal. Where, as is generally the case, the disease is strictly localized and the carcass is otherwise in good healthy condition, no harm would accrue to mankind by eating the latter. This course, however, can only be recommended when the whole carcass has been rigorously inspected by a person competent to undertake such duty, and by that we mean a duly qualified veterinary surgeon. In this case he, of course, would use his judgment in deciding whether the edible portions should be condemned or otherwise. In every case, however, the diseased structures—head or other organ—must be thoroughly destroyed, preferably burned, and if the carcass show evidence of general disturbance, emaciation, etc.—even if in such carcass the disease (actinomycosis) be localized—we hold that the whole should be condemned.

Actinomycosis.

1 and 2.—Animals suffering from Actinomycosis.
3 and 4.—Sections of tissue (magnified).
5.—Small portion of edge of colony of polynuclear leucocytes (very highly magnified).

With regard to Milk.—The milk yielded by an actinomycotic udder should not be used for food purposes. It is possible, although it must be admitted that this has never yet been definitely proved, that the milk from such an udder may contain the actinomyces organism, and thus may be a source of danger to animals (including man) which may subsequently ingest it. All possibility of such danger would, of course, be removed by boiling the milk for a few minutes prior to utilizing it for food purposes, but few, we imagine, would care to drink such milk even if aware that it was incapable of infecting them with disease.

South African Maize Export.

ANNUAL MAIZE COMMITTEE, 1911.

Meeting held in the Office of the Chamber of Commerce, Capetown, on Monday, the 24th April, 1911.

PRESENT :

Chairman—

Mr. F. B. Smith, Acting Secretary for Agriculture.

Members—

Mr. K. Spilhaus (Capetown), Mr. H. D. Clinch (Durban), Mr. E. H. Sinclair (Johannesburg), Mr. H. Ruffel (Bloemfontein) — Representing the Associated Chambers of Commerce of South Africa.

Mr. M. J. Joubert (Bloemfontein), Mr. J. Marwick (Natal) — Representing the South African Agricultural Union.

Mr. McLean, representing the Conference Shipping Lines.

Mr. W. W. Hoy, Acting General Manager of the South African Railways.

Mr. C. H. Keet, Chief Inspector of Grain.

Mr. J. M. B. Stilling-Andersen, Director of Co-operation.

Secretary—

Mr. S. Y. Eales.

In Attendance—

Mr. G. F. Nussey, Assistant Chief Inspector of Grain.

Mr. Fulton, of the South African Railways.

Dr. Eric A. Nobbs, Director of Agriculture of Rhodesia.

Mr. B. Enslin, of the Department of Agriculture.

ABSENT :

Mr. J. W. Honey, Secretary for Commerce and Industries.

Two delegates of the South African Agricultural Union, representing the Transvaal and the Cape of Good Hope.

AGENDA.

The following was the agenda paper of the meeting :—

(1) Report of Chief Inspector of Grain for 1910 season.

(2) *The number of grades.* Should the present grades be reduced in number?

(3) Bags :

(a) Quality and weight.

(b) Desirability of standard bags being branded by manufacturers, who would thus guarantee the quality.

(c) Method of sewing.

Rebagging.

(4) Marking:
(*a*) Grade marks.
(*b*) Identification.
(5) Certificates:
(*a*) Inclusion of name and title of Chief Inspector of Grain.
(*b*) Dates of certificate.
(6) Moisture.
(7) Weevily maize:
(*a*) Conveyance by rail.
(*b*) Storage.
(*c*) Shipment.
(8) Weights:
(*a*) By whom should weights be taken?
(*b*) Where?
(*c*) Should weights be shown on certificates?
(9) Sea freights:
(*a*) Rates.
(*b*) Freight available.
(*c*) Bills of lading.
(10) Grading:
(*a*) By producers on the farm.
(*b*) By official graders.
(11) Standard samples:
(*a*) How selected.
(*b*) Distribution.
(*c*) Cost of.
(12) Grading of produce other than maize or kaffir corn:
(*a*) Optional or compulsory.
(13) By-products of maize.
(14) Statistics.
(15) Amendment of existing regulations.
(16) General:
(*a*) Storage of maize at ports.
(*b*) Proposed prohibition of export of kiln-dried maize under Government supervision.
(*c*) Desirability of obtaining standard samples from other countries for exhibition at agricultural shows for purposes of comparison.

The Committee met at 10 minutes after 10 o'clock.

The Chairman stated the Committee was met to continue the series of Conferences established in connection with the export of maize. It was probably within the recollection of at all events some of the gentlemen present that when maize was first exported from Natal a conference of officials from the various departments concerned was held in Pretoria; that Conference was subsequently enlarged to embrace representatives of the Chambers of Commerce and Agricultural Unions, and the Committee was constituted in the same manner to-day. There were present representatives from the Government departments concerned, from the shipping lines, from the merchants, and from the farmers. He was sorry that Sir Thomas Price had not been able to return in time for the meeting. It had been hoped a good deal of information could have been obtained from Sir Thomas. As the Committee was probably aware, Sir Thomas had gone to Europe

and America to study the conditions of transporting and handling maize, and they had hoped he might have attended the meeting to enlighten the Committee on those subjects.

The next subject to which Mr. Smith desired to refer was the crop for the present year and the prospects for export oversea. He was sorry to say the reports received from the several Provinces and portions of the Provinces went to show that the crop was most disappointing. In the first place, a larger area had been planted with mealies this year than ever before, but unfortunately a severe drought was experienced, and this was followed by a spell of wet weather, which forced the mealies into rapid growth at the time they were pollinating, apparently preventing the ears from becoming properly fertilized. The consequence was that there were many mealie stalks without any cobs on them, and that the crop looked better than it was in reality. According to the latest estimates there would be but a very small quantity indeed for export. That was the unpleasant news he had to tell them. So far as approximation went, the crop would not much, if at all, exceed their own requirements for the year, and it was still to be borne in mind that the late rains had stimulated the growth of the crops which were not yet ripe, and if frosts were experienced additional damage might result.

Mr. McLean asked about the new pest which he had seen referred to in the Press.

The Chairman replied that so far as could be gathered that had always been in South Africa.

Mr. Spilhaus asked for particulars of the estimated crop available and the estimated consumption.

The Chairman stated he had no figures with him, but he thought the shortfall would be about equal to the exports of the previous year. He hoped he might be wrong, but he thought it right to tell the Committee his fears as soon as the news of the possible shortfall came to his knowledge.

The Chairman stated that the report of the Chief Inspector of Grain for the year 1910 was before the Committee. He thought he was correct in stating that practically all the resolutions passed at the Conference last year and at the subsequent meeting of the Committee in Durban had been given effect to.

As Mr. Hoy and Mr. McLean desired to get away early, the Chairman agreed that Railways and Shipping business should be dealt with by the Committee before other business.

The Committee accordingly passed to item 3 on the agenda.

GRAIN BAGS.

The Chief Inspector of Grain explained that this question had been brought forward because he wanted a full description of the bag intended to be used for the export of maize. He suggested that the description should read: "An A twill bag, 8 porter 8 shot, weighing 2½ lb.".

The Chairman referred to the indefiniteness of the description of bag recommended by the Bloemfontein Conference. The Government had adopted the recommendation, because it was naturally thought the merchants then present knew exactly what was required, but it appeared this was not so, and confusion had arisen owing to the description being inadequate.

Mr. Ruffel thought the question should be finally settled. At the Bloemfontein Conference it was given out that after a certain date only A quality twill bags would be accepted for export. This information was subsequently published, and merchants imported A quality twills. In the railway tariff books it stated that all maize for export must be in 2½-lb. bags, double sewn; there was nothing said about A twill, and it appeared as if the old 2½-lb. bag could again be regarded as 2½ lb. If that were the case those merchants who had imported A twills would suffer. In the *Union Gazette* of the 17th February it was notified that owing to a misdescription the words "A quality twill" were erroneously used in the previous notification. He could not see the point. At the Bloemfontein Conference it was resolved that A twill should be used, and numbers of merchants had imported A twill, and they were landed with bags at a high cost, which put them at a disadvantage with those who had imported inferior bags if the latter were to be accepted for export. He thought that as A twill was stipulated for in the first instance it should be insisted on.

Mr. Spilhaus did not see what the difficulty was, as A twill is a recognized bag known in the trade. There are 2½-lb. bags which come out the right weight on the bale, but the 2½ A twill comes out more or less even weight on each bag. It would be the greatest possible mistake to change the regulations.

The Chief Inspector of Grain explained that there are two sorts of A twills, one 8 by 9 and the other 8 by 8. He wanted to know which should be used.

Mr. Sinclair said the majority of bags carrying maize last year were 8 by 6, and there had been no complaint. That was A twill. It would be rather hard on merchants who had imported 8 by 6 if 8 by 8 were insisted on.

The Chairman stated he was no expert in bags; he wanted the opinion of the merchants.

Mr. Clinch explained that by A twill 2½ lb., the Natal merchants understood the 8 by 8 bag.

The Chief Inspector said that in the trade the 8 by 8 and 8 by 9 are both known as A twill.

Mr. Clinch thought that if the bag was described as 8 by 8 there would be difficulty in distinguishing it from the inferior bag. Would it not be possible for the Government to prohibit the importation of any other bag of the same reputed weight—2½ lb.?

Mr. Spilhaus said not, as the inferior bags were used for oats and other grain.

Mr. Hoy read contract No. 61 of the London Corn Trade Association, as follows:—"Sound merchantable 2½-lb. twill bags".

Mr. Spilhaus thought the description should remain as it was for this year, and the matter left to the discretion of the graders as to what they should pass. He thought, however, that 8 by 8 should be stipulated for next year.

The Chairman asked whether it was intended that 8 by 6 and 6 by 9 bags should be passed.

The Chief Inspector of Grain replied in the negative.

Mr. Hoy thought the proper pattern should be fixed at once, and then if it was necessary to defer its use for another year it could be done.

After further discussion it was resolved:

"That maize intended for export oversea shall be contained in A quality twill bags of 2½ lb. weight, 8 porter 8 shot."

Mr. Hoy asked from what date that resolution was to have effect. He wanted the question settled definitely at once. It was originally decided that A twill should be insisted on from the 1st July, 1911. Was it intended now to give exporters another year's grace from that date?

Mr. Ruffel suggested that the stipulation should come into force as from the 1st July, 1911. Importers had been given suitable notice and should not be given another year's grace.

It was thereupon resolved:

"That the stipulation in regard to bags should come into force on the 1st July, 1911."

Mr. McLean inquired whether the Chief Inspector of Grain would be able to determine whether or not the bags were the correct pattern.

The Chairman replied that any properly qualified person could determine the fact.

Mr. Marwick asked whether it is possible to distinguish the one bag from the other.

The Chief Inspector of Grain explained that the quality of a bag could be determined by counting the number of threads running each way.

On the question of branding maize bags intended for export, the Chief Inspector explained that the reason for setting this proposal forth was that it was thought it would be possible to arrange for all bags intended to contain maize for export to be branded in some distinctive manner, but after making full inquiry he had come to the conclusion that such a proposal was impracticable.

The Chairman said the next question was the method of sewing the bags. He did not know much about such matters; he wanted the opinions of Messrs. Hoy and McLean.

The Chief Inspector of Grain said he put the proposal to abolish the lugs or ears on the bags forward, because he thought there was a good deal of wastage on this side of the water in handling bags which had been sewn with lugs. On the other hand, however, it appeared from evidence obtained in Europe that if the lugs were abolished there would be a danger of damage to the bags and consequent wastage, because the stevedores would be tempted to use hooks.

Mr. Hoy said his information from Europe was that opinions differed. In South Africa the bulk of opinion was in favour of continuing the lugs.

Mr. Spilhaus thought that if lugs were abolished hooks would certainly be used. There should be no danger of leakage even when lugs were left on the bags if the latter were properly sewn. Mr. Spilhaus explained exactly how a bag should be sewn; the needle should be put through the lug before the twine was wrapped round it and again afterwards.

Mr. McLean thought it far better to have lugs on the bags, otherwise hooks would certainly be used in handling them.

The Chairman asked Mr. McLean whether lugs were preferable from a shipping point of view and received an answer in the affirmative. He then asked Mr. Hoy the same question, and Mr. Hoy stated that the Railways had no objection to lugs being left on the bags.

Mr. Hoy thought that demonstrations should be given at the different agricultural shows so that farmers would know just how to sew their bags. The graders should take particular note of consignments where bags are not properly sewn, and a printed circular (with

illustrations) should be prepared so that a copy of it could be sent by the graders to each of the offenders.

The Chairman agreed that that should be done.

Mr. Joubert was of opinion that every farmer knew just how to sew a bag; the only thing was that it took a little longer to sew it properly than it did if it were stitched anyhow.

Mr. Marwick said he understood Mr. Spilhaus to say the bags were sewn forwards and backwards. Would it not be sufficient if each bag were sewn once with double twine?

Mr. Spilhaus did not see why bags should be double sewn; if a man knew how to do it there would be no leakage from a bag sewn one way as long as it was closely stitched.

The Chairman thought the regulation that bags must be double sewn would not have been introduced unless there were good reason for so doing.

The matter was then dropped.

The Chairman said the next item was

THE REBAGGING OF MAIZE AT THE PORTS.

The Chief Inspector of Grain said the Railway Administration had embodied a regulation in the instructions to its staff which provided that ordinary railway rates should be paid on any consignments of mealies rejected by graders on account of the use of old or unfit bags. This was not as it should be. To permit wet maize to be rebagged and to refuse the privilege to sound grain was inconsistent. He thought the Government should not hamper the trade in any way; the intrinsic value of mealies was so small that they could not stand these petty charges.

Mr. Hoy said the point was there were so many cases of this nature. He thought the instruction was given at the instigation of the Department of Agriculture to try to put an end to the practice of railing grain in unsound bags. If the penalty were such a one as to discourage the practice it would be desirable to enforce it. Merchants would be occupying space in railway sheds whilst rebagging was proceeding.

Mr. Spilhaus thought the practice would be discouraged by the extra cost involved in rebagging. That was quite sufficient penalty.

The Chairman thought that if a consignment arrived at a port and the grader could not pass the bags, the consignee should be permitted to rebag.

The Committee resolved:

"That if a consignment arrives at a port and the grader cannot pass the bags the consignee shall be permitted to rebag."

Mr. Hoy asked whether there was much rebagging going on at the present time.

The Chief Inspector of Grain said there was not so much now, and as soon as the new bag commenced to be used there would be practically none.

Item 7—

WEEVILY MAIZE.

The Chief Inspector explained that the Railway Administration had expressed its willingness to wash trucks which had been used for the carriage of weevily maize at a cost of 6d. per short or 1s. per bogie truc

Mr. Hoy said this was a matter which had received the attention of the Railway Board, which was of opinion that the charge for this service was a legitimate charge against the Agricultural Department. The Railways did not want to carry weevily maize; it was not their business to carry consignments which were not equal to the ordinary standard. If such grain was to be carried the Railways would do it, but the extra charges involved must be paid for by somebody other than the Administration.

Mr. Spilhaus thought they should be paid by the sender.

Mr. Ruffel instanced the case of mealies railed in sound condition which showed signs of weevil on arrival at the port; that meant that the railway truck was infested. Weevily grain had to be marketed as well as sound grain. Three-fourths of the railway trucks used for carrying sound grain were infested with weevil, and the sound grain became infected thereby. The Railway Administration should cleanse all its trucks at certain seasons of the year.

Mr. Hoy asked how this weevily maize was dealt with in the stores on arrival at the ports.

The Chief Inspector of Grain stated that it was dealt with in a special store.

Mr. Spilhaus said nearly all the weevily mealies were used for local trade. If an extra charge were made for carrying weevily grain for export there might be difficulty in connection with the local traffic. One could not compel a man who railed at local rates to declare his grain as weevily; he would not do it.

Mr. Marwick referred to sound grain sent to a port which developed weevil en route.

Mr. Sinclair thought it would be difficult to decide who should be responsible for cleansing weevily trucks since they carried weevily maize for local consumption. Weevils often developed en route.

Mr. Hoy thought they did not develop during railway transport.

Mr. Sinclair thought they might. He considered the Railways should bear the cost of cleansing the trucks.

Mr. Hoy said it looked as though the merchants desired to saddle the Railways with the faults of other people. Why should the Administration pay for other people's faults? If weevily maize is a marketable article the sender should pay the extra charges involved. It might not be a man's fault that he had to send weevily grain, but he should send sound grain.

Mr. Andersen asked the cost involved.

Mr. Hoy replied 6d. per truck.

The Chairman said the difficulty would be to collect the 6d. Was there any direct means by which it could be collected?

Mr. Hoy said it would be done in every case except perhaps in the case of local traffic.

Mr. Spilhaus thought it would be a simple matter for the Railways to instruct station masters at forwarding stations to collect 6d. from the consignors in the case of maize declared weevily; in the case of grain arriving at the port weevily the Railways should cleanse the trucks on their own account.

Mr. Ruffel said the trucks should be cleansed at certain times of the year; it was not a question of a few trucks, but of thousands of trucks. Sixpence was not very much on a truck, and he thought there would be no one who would refuse to pay it. What could be done, however, in the case of weevily maize railed at local rates from one

station to another and then unloaded and reloaded with sound grain for export?

Mr. Marwick thought weevils developed en route. How would the charge be collected then?

The Chairman said if they developed en route he thought his department must stand the loss.

Mr. Hoy agreed that the charge should be made in the case of mealies for local traffic as well as for export.

The Chairman asked Mr. McLean if he had any remarks to offer, and received an answer in the negative.

Item 8—

WEIGHTS.

The Chief Inspector of Grain said it appeared the buyers on the other side wanted port weights taken, and he did not know who was to take them. It was impossible for the graders to do so.

Mr. Andersen said the growers had experienced much trouble in this direction, and people in Europe had asked him whether it would not be possible to have the weights taken by the graders. It would greatly simplify matters if the graders could undertake this work.

The Chairman said from opinions obtained in Europe there was no doubt they wanted correct weights taken at time of shipment.

Mr. Spilhaus said they could get that now.

Mr. Ruffel said the difficulty was that weights taken at present were not reliable.

The Chairman did not see how it was possible to get exact weights except by weighing the mealies a bag at a time, and then the cost would be tremendous.

Mr. Andersen thought the buyers would want to know when the maize was weighed. So far as up-country sellers were concerned, the weight was taken on the truck on its arrival at the port, and thereafter the truck was tared, but he did not see how that would affect the question of final weights on shipment.

The Chairman did not see how weighing could be performed after the grading had been done.

Mr. Spilhaus explained how the weighing was done at Capetown. The trucks were weighed by the Railways as they came in. They were re-tared immediately after they were off-loaded in the grading shed. At time of shipment the maize was reloaded into trucks for transport to the ship's side, and the trucks must pass over the weighbridge again. So far as Capetown was concerned, the weights were accurately taken; the only question at Capetown would be whether the weighbridge itself was accurate. Another thing Mr. Spilhaus pointed out was that the contract provided for delivered weights. To get accurate weights one had to weigh over a scale, and it was questionable whether they could weigh over a scale at time of shipment. He could assure the Committee that his shipments to Europe came out on an average loss of ⅜ per cent. in weight, and he thought that showed that weights taken at Capetown were fairly accurate. In one consignment to Messrs. De la Condamine & Johnston there had been an error, but that was through wrong figures being entered; the weights were correctly taken.

Mr. Clinch said things were different at Durban; there was but one weighbridge, and throughout the last season they had found the weights most inaccurate. When they had had them checked by the

African Boating Company or their agents they hardly ever agreed. The present system was most unsatisfactory. They wanted the weights for the satisfaction of the buyer and seller in South Africa.

The Chairman said the trade in Europe seemed divided in its opinion; some firms wanted the weights and others did not care about them.

Mr. Andersen said the experience of sellers up-country did not bear out what Mr. Spilhaus had said. If the Committee was going to inquire into this matter the inquiry should be made at all the ports. The chief point to be decided was who was to be responsible for the taking of correct weights. He thought the Chief Inspector should be responsible.

Mr. Hoy said the question was one of some importance, and it would be as well to, if possible, come to some satisfactory arrangement. It was quite obvious that the weighing was important as between buyer and seller, and it was equally important that the weighing should be done at the ports and not at the sending stations. If one weighbridge was insufficient, he would see what could be done. The Railways took an approximate weight only for determining the rate of railage. At the ports there were, he believed, two systems. The one was weighing a few bags upon a small weighbridge, which was too slow and too expensive, and the other was the weighing of the trucks, and this was a procedure in which every care must be taken. The tare of trucks was constantly varying. Every truck must be weighed twice if one wanted accuracy. Then the weight of the sheet must be taken into consideration, and that also varied. It it were a good scale, and was taken care of, one could weigh accurately on a weighbridge. The sheets should be taken off the trucks before weighing. It was better to get down to business rather than to hide the real issue. The Railways were not concerned with either buyer or seller—they had no interest to serve in the matter. He thought the organization was one which should be undertaken at the ports, and, secondly, he entirely agreed with Mr. Andersen, it should be undertaken by the graders; otherwise there would always be constant friction.

The Chairman said the difficulty was, how was this to be done.

Mr. Spilhaus said all maize passed over the weighbridge on arriving at the port; that was the weight for settling between seller and buyer here.

Mr. Sinclair said he took it that all maize was sold on out-turn in Europe. He thought, however, somebody should be responsible for port weights, but whether the Railways or the Chief Inspector of Grain he left it to the Committee to decide.

The Chairman said the Railways estimated it would cost 6d. per ton to weigh the maize.

Mr. Spilhaus said that was weighing over a scale.

Mr. Clinch was not satisfied with the system at Durban. The stuff came out from the weighbridge, and the truck was probably not returned to be re-tared until eight days later. The weights were not accurate, and the maize was not re-weighed before it was shipped.

Mr. Hoy said he thought some one would say the weights were inaccurate, so a series of tests had been carried out. The weights were not inaccurate.

Mr. Andersen said he could support Mr. Hoy so far as the weighbridge at Durban was concerned.

Mr. Spilhaus said he thought the Capetown system was the better one, and that it should be introduced at the other ports.

The Chairman stated that the London Corn Trade Association had expressed the opinion that the system of weighing in vogue at Capetown was most unsatisfactory.

Mr. Andersen suggested that Mr. Hoy's recommendation should be agreed to. The tare of the trucks should be taken immediately after the truck was weighed. That was how it was done at Durban.

Mr. Hoy said he thought the weighbridge at Durban was in the wrong place, and that should be looked into.

The Chairman asked whether the Committee thought one weighing sufficient.

Mr. Clinch said not if the weight had to be put into the certificate.

Mr. Spilhaus said the shipper paid for the second weighing.

Mr. Clinch replied that Durban exported two-thirds of the maize from South Africa, and if it had to be weighed twice they would never get it away.

Mr. Spilhaus thought that if the weight was to be shown on the certificates it should be shown on the Capetown certificates as "taken immediately before shipment" and on the Durban certificates the date on which the maize was weighed should be shown.

The Chairman inquired whether the Committee thought the graders should assume any responsibility for the weights.

Mr. Spilhaus thought the graders should assume responsibility for weights inwards.

The Chief Inspector of Grain could not agree to that proposal. He wanted the Railways to do the weighing and be responsible.

Mr. Hoy inquired in what way the Administration was interested. Why did they want to impose the responsibility on him? If it was necessary to put an officer of the Agricultural Department on the weighbridge, why not do so? The Railways would co-operate in every possible way.

The Chairman inquired whether the Committee agreed that the taking of the weights on the receipt of the trucks from up-country was sufficient.

Mr. Ruffel asked Mr. Hoy, assuming the railway weighbridge at Durban was in good order, and weighed correctly, whether the wind might not cause a difference of 700 lb. in weight? Personally he thought the grader should take the weights, but, in any case, they wanted correct weights whoever took them.

The Chairman asked the Committee whether it was thought one weighing would suffice.

After further discussion,

Mr. Spilhaus said that if re-weighing were abandoned no further trouble need be taken. The weight taken on arrival at the port could not possibly be put on the certificate.

The Chairman said private weights could not be put on the certificates either.

Mr. Clinch presumed that where possible private weights could be put on the certificates.

The Chairman feared it would not be possible to allow that.

The matter then dropped.

RECEIPTS AT FORWARDING STATIONS.

Mr. Sinclair asked Mr. Hoy whether he would grant receipts at forwarding stations for the number of bags railed for export.

Mr. Hoy asked Mr. Sinclair whether the Railway Administration got 10s. per ton on export maize, and Mr. Sinclair replied in the affirmative.

Mr. Hoy said the Railways collected 10s. on each ton and gave a lot of it away. There were charges at the ports to be met. When this special rate was granted it was granted as a haulage rate only, and out of that they had to surrender a portion for other charges. It was no use his saying he would grant receipts, because he was not in a position to do so. If the Administration had to keep staffs at the many stations throughout South Africa, what would be the expenditure involved? The poor station master was a very useful man and he would have to undertake the responsibility; how was he to do it? It could not be done. With the poor up-country farmer Mr. Hoy had as much sympathy as anybody, but most of the stations were small ones, and it would be impossible to check the number of bags and give receipts. Where there was a station master he had many things to do—post office work, telegraphs, everything—and his time was fully taken up. The alternative was to employ some one to do this service, and who would pay for it? They would have to pay 12s. per diem for a man, he would have to get quarters—at a cost of about £500—and the Administration would have to find him many other things. To get back to the plain issue Mr. Hoy thought he was being asked the impossible.

Mr. Spilhaus said it was possible so long as one paid for it.

Mr. Hoy agreed it was possible if it were paid for.

Mr. Spilhaus said there was one other point he wished to refer to. There was a considerable amount of dishonesty going on. People knew the maize was railed at owners' risks, and consequently little care was taken. The trucks were shunted into sidings, and numbers of bags fell off.

Mr. Hoy did not believe there was any systematic stealing from trucks in South Africa. If it fell off the trucks that was one thing, but he was satisfied there was no question of a business or a gang of thieves going along a thousand miles of line to pick up a bag here or there.

Mr. Spilhaus said that whenever they had sent in any claims for shortages—they knew it was no use, but they always put them in—they were always returned in a day or two without being inquired into.

Mr. Andersen suggested that the trucks should be sealed.

Mr. Hoy said one could not seal a tarpaulin. One could, of course, seal a box truck.

Mr. Andersen asked Mr. Hoy whether it was totally impossible, and received the reply that the Railways could not do it.

Mr. Marwick could not see the difficulty. If a farmer said he put so much on a truck he would take care the full number was there, and if the truck was properly loaded it would take the station master no time at all to check them.

Mr. Hoy disagreed. If the Railways were to give a receipt the work must be done in a proper manner. When they gave a receipt they wanted to count the number of bags themselves.

THE CLEANSING OF DIRTY TRUCKS.

Mr. Spilhaus spoke of the cleansing of trucks. In many cases mealies had been loaded in dirty trucks, with the result that the bags had been rejected by graders.

Mr. Hoy said he knew; he was going into the matter.

Mr. Spilhaus inquired whether the Railways would accept responsibility for bags rejected on account of them having been loaded in dirty trucks.

QUESTIONS FOR THE FUTURE.

Mr. Hoy said he was looking into that. Before leaving the meeting there were one or two things he would like to draw attention to. There was one point—though it was probably not one for the consideration of the present meeting, but for some future meeting—and that was shipment in bulk. It had been engaging a good deal of attention and the time was probably arriving for the conveyance of maize traffic in bulk, though there was a good deal to be inquired into and a number of preliminary arrangements to be settled. It was a question of organization. There was also the question of whether elevators should be provided and whether they should be at certain centres inland or at the ports only. There was also the question of whether it would not be possible to determine the ports through which this traffic should be shipped. Of course there were many difficulties in a matter like this between the merchants and the shipping companies and the Government, but he thought that if it were possible the cost of handling would be lessened. The last thing he would like to mention was with regard to the shipping freight of 11s. 6d., which he thought was a London rate.

Mr. McLean said it applied to berth ports.

Mr. Hoy, continuing, said of course this was a matter about which one might have opinions, but he was diffident in expressing his own. He merely thought he would like to mention it for consideration, particularly because Mr. McLean was, he understood, going home shortly, and would have an opportunity of discussing the issue with his principals. He referred to the possibility of widening the ports at which delivery could be taken. He had in his mind that there were some places where the market was sufficiently large to justify the direct shipment of a certain quantity of maize traffic, and he thought there should be some agreement with the shipping companies whereby they could be induced to deliver at those ports at the 11s. 6d. rate. If that were not possible he would suggest as an alternative that such arrangements be made as would enable them to deliver maize at the ports he had in mind at a cost which would encourage the use of the South African article. He did not want to be in a hurry over any of these matters. He thought them all very important in connection with the maize traffic, and whatever people might say he thought it only due to the shipping companies to say they had done—and would he believed in the future do—much to encourage the trade in maize from South Africa to the large markets in Europe. He was not quite ready to discuss these and several other minor points he had in mind at present, but probably by next year some, if not all of them, could be advanced into a stage which would lay them open for discussion. He had discovered from inquiries that maize from South Africa was a better quality and would sell in the markets more easily than maize from any other part of the world.

Mr. Andersen said he took it from what Mr. Hoy had said that the question of splitting the country into railway zones would not be discussed at that meeting.

Mr. Hoy said he was not yet in a position to deal with the question.

(Mr. Hoy then withdrew).

Item 4—

MARKING.

The Chief Inspector of Grain said the buyers on the other side had asked for the inclusion of a crown in the grade mark to prevent fraud. They had also asked that the marks should be larger.

Mr. Spilhaus said if the marks were larger they could not well be placed on the end of the bags.

The Chief Inspector said buyers also wanted shippers' and graders' marks in one line.

Mr. Spilhaus said that would be too expensive. Shippers could not do it.

(Mr. Honey attended at this stage).

The Chief Inspector said buyers had also suggested that the red colour should be done away with as it was apt to become faint and indistinct.

Mr. Anderson suggested that brown should be used instead of red.

Mr. Spilhaus thought if the red were a little darker it would do.

The question of marking bags was left open for another year so that experiments might be made.

Item 9—

SEA FREIGHTS.

The Chief Inspector said this item was placed on the agenda because the existing contract expired on the 30th June, 1911, and because requests had been received for additional steamship facilities.

Mr. Spilhaus thought the Committee should pass a resolution to the effect that any ports not served by the Conference Lines by direct steamer should be left as open ports independent of the Conference Lines without loss of rebates.

Mr. Honey inquired which ports were referred to.

Mr. Spilhaus said he referred particularly to Havre and other French ports. They had peculiar laws in France, and if one had to get the consent of the Conference Lines to ship direct and then to comply with the law so much time was lost that it was frequently too late to do business.

Mr. Clinch thought such ports as Hamburg and Antwerp should also be open ports as the Conference Lines would not take whole cargoes to those ports. If they could ship in full cargoes they could always obtain 1s. per quarter more for their grain. The Irish people, for instance, would not take parcels, and therefore they could not send maize from South Africa to Ireland. The Irish trade was peculiar; they wanted all their maize of the one kind.

Mr. Andersen seconded Mr. Spilhaus' resolution.

It was resolved:

"That this Committee recommends that it should be open for shippers to make their own arrangements for full cargoes to all ports without forfeiting rebates, and that the Conference Lines should allow shipments by outside steamers to Continental ports other than the open ports without forfeiture of rebates."

Mr. McLean said he could only say that the representations made by the gentlemen present would be laid before the Conference Lines

when he got home. He had no doubt the matter would receive every consideration. As the Committee was probably aware, the Lines had just arranged with the Government to extend the present contract for another year or so, so that shippers could send their maize to berth ports at 11s. 6d. per ton, and they could send to the other ports Mr. Hoy referred to at an additional charge of 3s. 6d. per ton. It was impossible, of course, for the Conference Lines to take full cargoes of maize by the present steamers. They could not get steamers to come to South Africa for full cargoes at anything like the rate paid now. He remembered last September, when he was in England, the trade was congested at Durban, and the Government asked the Lines whether they could help by putting on additional steamers to get the maize away, and the Lines said they would do all they could to get a steamer running in the American trade diverted from there to load at Durban. They went into the market for the additional freight and one steamer could be obtained at 13s. 6d. subject to reply in twelve hours; the information was cabled to South Africa but no reply was received. Then the High Commissioner inquired into the matter; the same steamer was offered but the rate went up to 15s. also subject to reply within twelve hours. Then Mitchell Cotts were asked and they went into the market and the rate had gone up to 20s. So many people going into the freight market at one time had put the freight up. Vessels coming with outward cargoes often had to go elsewhere for freight. It was to be remembered that the maize season was the fruit season and the wool season as well. It would be interesting perhaps to see what space the Conference Lines had available last year. It was as follows:—

Intermediate steamers from all ports	... 52,000	tons.
Bucknall Line	... 15,000	,,
German East African	... 4,000	,,
King and Rennie boats	... 15,000	,,
Total	... 86,000	,,

So it was not for lack of room on steamers that maize was shut out. Maize was sent to Durban instead of being sent to Cape ports where tonnage was available. He would suggest that merchants should ship from other ports than Durban. He felt bound to add, however, that maize was expeditiously handled at Durban and the shipping companies were glad to get it at that port. It was handled better at Durban than at any other port.

Mr. Andersen said he understood that the 86,000 tons of freight was distributed throughout the year. He would like to know how much was available during the maize season—June to December.

Mr. McLean read the following statement:—

18th July.—Comrie Castle, space available, 1500 tons—none shipped.

21st July.—Dover Castle, space available, 1200 tons—1170 tons shipped.

12th August.—Cluny Castle, space available, 4000 tons—2193 tons shipped.

18th August.—Durham Castle, space available, 2017 tons—ship filled.

27th August.—Goth, space available, 1025 tons—practically filled.

15th September.—Goorkha, space available, 3000 tons—921 tons vacant.

In any case from the 27th August down to 26th December every steamer left Durban with considerable space available.

Mr. Andersen asked for information regarding East London. Was there not more tonnage allotted to that port than could be filled.

Mr. McLean explained there were some steamers that did not go beyond East London; they turned there. If some of the maize had been sent to East London instead of Durban there would have been no congestion.

Mr. Andersen asked Mr. McLean whether he favoured Mr. Hoy's suggestion that it should be compulsory to send maize to one port.

Mr. McLean replied that Mr. Hoy evidently meant that recommendation for the consideration of merchants and did not mean it should be compulsory.

Mr. Andersen raised the question of booking freight.

Mr. McLean said such a scheme would not work. They had tried it.

Mr. Ruffel said the up-country exporter would not ship unless he could be certain of the space he required.

Mr. Spilhaus said personally he felt under some obligation to the shipping companies. He made a very large purchase at the beginning of the year before last. He booked freight with the Union-Castle Company for 30,000 bags for shipment before a given date. The parcel was not railed until the end of April, and although he had definitely engaged to send that parcel the shipping lines let him off. It was not always easy to guarantee freight because up-country sellers did not keep their engagements.

Mr. Andersen said that did not affect the question. If the coastal man was responsible Mr. Spilhaus would see that the man up-country paid any damage that might ensue through his failure to keep his promise.

Mr. Clinch agreed. The shipper would pay for the freight if he did not use it.

Mr. McLean said they had been asked over and over again at Capetown, at Durban to give certain space in a certain steamer on given dates, and he could give a long list of cases where when the time came the maize was not forthcoming.

Mr. Clinch said that was because the merchants had no guarantee. If the market went against the shipper he did not ship. He would ship if he got a guarantee.

Mr. Spilhaus said that had been the practice so far as he was aware.

Mr. Clinch continued. They did not give the merchants time to get outside freight.

The Chairman was afraid the Committee could not do much if the shipping companies would not enter into an agreement on the point.

Mr. McLean said that the Lines while not guaranteeing to find space always did their best. If the shipping companies refused to accept maize the shipper had the right to go into the market for freight.

The Chairman thought no useful purpose would be served by pursuing the discussion.

Mr. McLean said that if the Lines would not guarantee space merchants were perfectly at liberty to go out into the market. If a merchant said he wanted tonnage for 2000 tons for shipment in September and the Lines said he could not get that space, he was perfectly at

liberty to go elsewhere. But, of course, if they booked the tonnage and the merchant did not ship he would have to pay the freight.

Mr. Spilhaus thought shippers should be left to make their own arrangements.

Mr. Honey asked whether it was not due to Captain Rainnie that things were so well handled in Durban last year.

The matter was then dropped.

Item 9 (*c*)—

BILLS OF LADING.

The Committee considered the draft bill of lading prepared by the London Corn Trade Association for use by the South African grain trade. It was stated that the London Corn Trade Association had invited the Conference Lines to go into a conference on the subject, but the latter were unwilling to do so.

Mr. McLean said the shipping companies before agreeing to meet the London Corn Trade Association asked for particulars of the objections to the present bill of lading. They did not refuse to go into a conference; they wanted to know first what was to be discussed.

The Committee resolved:

"That it is essential in the interests of the maize trade that the shipping companies should agree to the use of a bill of lading which is acceptable to the London Corn Trade Association and the Continental buyers."

(Mr. McLean then withdrew.)

Item 5—

CERTIFICATES.

On the recommendation of the Chief Inspector of Grain, the Committee resolved:

"That following the practice in vogue in other grain exporting countries, the name and title of the Chief Inspector of Grain should be imprinted on the certificates in addition to the signature of the grader."

Item 5 (*b*)—

DATES OF CERTIFICATES.

The Chief Inspector of Grain stated that some merchants had refused to show their bills of lading to the graders. In one case a complaint had arisen because the bill of lading and the grain certificate did not agree in date. He thought the only way out of the difficulty would be to lay down the principle "no production of bill of lading, no grade certificate".

Discussion ensued, in which it was pointed out that it was often difficult for the merchant to produce his bill of lading to the grader. The grade certificate was not issued until the grain was in the ship, and then it frequently happened that there was not time to submit the bill of lading to the grader; the merchants wanted to get them to the bank at once.

Mr. Andersen pointed out that Mr. Keet's suggestion would have to be adopted if it was proposed to carry out the resolution of the Bloemfontein 1910 Conference.

It was resolved:

"That this Committee do recommend to the Government that the certificate of grade shall only be handed out on production of the bill of lading."

The Committee adjourned at forty-seven minutes after twelve o'clock.

The Committee resumed at thirty-seven minutes after two o'clock.

Railways and shipping matters having been dealt with, the Committee decided to resume the agenda.

Item 1—

REPORT OF CHIEF INSPECTOR OF GRAIN.

The Chairman said the report of the Chief Inspector of Grain for the past year was before members, so there was nothing to be said on that point.

Item 2—

GRADES.

The Chairman thought this a most important matter. It had been suggested that the number of grades could be profitably reduced. The number of grades had been greatly reduced from the time they were first instituted. The Committee had before it the suggestions of the Chief Inspector of Grain, which were as follows:—

1910 Grades.	Proposed New Grades.
F.W. 1	F.W. 1.
F.W. 2	F.W. 2.
F.W. 3	F.W. 3.
R.Y. 1, R.Y. 2	Round Yellow.
R.W. 1, R.W. 2	Round White.
F.Y. 1, F.Y. 2	Flat Yellow.
Round Mixed, Flat Mixed	Mixed.

Kaffir Corn grades to remain as before.

Mr. Marwick inquired whether it was proposed to reduce the standard of the grades. He considered that the Flat White No. 1 was not really a first-class mealie or anything like it. No. 1 should really be a higher class than it was at present.

The Chief Inspector of Grain stated that so far as White Flats were concerned, he thought the grades should be left as they were with one alteration. F.W. 3 was described at present as containing not more than 8 per centum discoloured and 8 per centum defective grai[illegible] the difference between the F.W. 3 and Mixed Flat as it stood was too small, and he thought the No. 3 White Flat should be raised to contain not more than 5 per centum discoloured and 8 per centum defective grain.

Mr. Clinch believed the white maize produced in Natal was superior to that produced in any other Province. In the coastal districts of Natal there were mealies which would not grade as F.W. 3 on account of discoloured or defective grain, but they were much above the Basutoland maize in value. It was really F.W. Mixed, there being about 15 per cent. yellow grain in it. If they could have one grade in place of F.W. 3 to cover a superior mixed mealie it would be a good thing. The difference in price between Natal maize (mixed) and Basutoland Mixed would be between 1s. and 1s. 3d. per quarter.

The Chairman thought it difficult for the Committee to reduce the number of grades unless they took another pull at the Whites. If

they had an ordinary F.A.Q. White it would not stand out as it should. Flat White 1 should be a really first-class mealie, as stated by Mr. Marwick.

Mr. Clinch said the F.W. 1 was looked upon on the Continent as practically a seed mealie.

The Chairman pointed out the exceedingly slight difference in the prices obtained for the several grades.

The Chief Inspector of Grain stated that during the 1910 season there were graded at Durban:

Round Yellow Choice, 11,613 bags.
Round Yellow 2, 211,606 bags, or 5 per cent. of the superior quality.
Round White Choice, none.
Round White 2, 53,486 bags.
Flat Yellow Choice, 2,839 bags.
Flat Yellow 2, 32,542 bags, or 7 per cent. of the superior quality.

Mr. Ruffel said he understood the grades were now to be fixed on such a basis that further alterations would be unnecessary for many years to come. As there was not sufficient maize produced to justify so many grades, he suggested that F.W. 3 be abolished, and that consideration should not be given to the many varieties of mixed maize produced in particular parts of the country. He pointed out that the Americans had fixed standards which everybody understood. The No. 1 Flat White was necessary, because it was used for seed on the Danube. He supported the suggestion to eliminate F.W. 3.

The Chief Inspector of Grain stated that the Bloemfontein Conference raised the standard of No. 2 White above the old F.A.Q. grade, and if the F.W. 3 were abolished it would be necessary to reduce the standard of the F.W. 2, or throw out a certain percentage of good grain and place it under Mixed. He thought it would be undesirable to accept either alternative.

Mr. Andersen said the Flat White was used for local consumption. More than half the South African grain was used for local consumption. He thought the F.W. 3 should not be put down as below grade.

Mr. Sinclair said in the Pietersburg District they produced a mealie which was not uniform in the grains; it would not pass as No. 2.

Mr. Honey inquired whether it was passed as F.W. 3, and Mr. Sinclair replied in the affirmative.

The Chairman inquired whether it was worth while to retain the Choice White, and the meeting signified unanimously that it was.

The Chairman thought in that case it would be well to keep the other two grades so that the Choice could be regarded as an outstanding quality.

Dr. Nobbs was understood to say that in Rhodesia they had two grades, Choice and F.A.Q. The slightly inferior maize was used for local consumption.

Mr. Joubert said the original reason for making the three grades for Flat Whites was that Natal grew a better White Flat than either the Free State or the Transvaal; the F.W. 1 practically represented the Flat White of Natal, whilst the F.W. 2 represented the bulk of the Free State and Transvaal crop.

Mr. Clinch thought that meant they would not have two mixed grades.

The Chairman thought an F.A.Q. Mixed sufficient.

Mr. Ruffel pointed out that to leave F.W. 3 this year might mean changing the grades again next year.

Mr. Marwick contended it was still necessary to have two grades for Flat Yellows. Although the Chief Inspector of Grain stated that only 7 per cent. of Choice Flat Yellow was shipped last year, he thought they ought to encourage the man who produced good stuff.

The Chairman said the difference in price was surprisingly little.

Mr. Honey asked what the opinion of the European Corn Trade Associations was on that point, and his attention was drawn to the fact that their reports were before him.

Mr. Andersen proposed that there should be three grades for Flat Whites, one each Round Yellow, Flat Yellow, and Round White, one Flat Mixed, one Round Mixed, and No Grade.

Mr. Joubert seconded.

Mr. Spilhaus said that for Round White No. 1 a better price was obtained.

The Chairman said the amount (increase) was infinitesimal.

Mr. Sinclair thought the Flat Mixed could take the place of the F.W. 3.

Mr. Spilhaus was of opinion that the Flat Mixed was practically Flat White 3. He thought it a mistake to alter the grades once they had been fixed.

Mr. Clinch raised the question of the exportation of maize rejected at the port on account of excessive moisture. Could that be railed for export at the special rate.

The Chief Inspector of Grain said the regulations prohibited the exportation of unripe or musty maize and the special rate could not be granted to those two classes.

Mr. Sinclair wanted F.W. 3 eliminated.

It was resolved:

"That the description of Flat White 3 should be amended to read 'and not containing more than 8 per cent. defective grain and 5 per cent. of other coloured grain'".

The question of the time when the changes should be made was discussed, Mr. Honey thinking they should come into force on the 1st July, 1911.

The Chief Inspector of Grain thought the changes should be made as from the 1st January, 1912, so that existing contracts could be completed.

Mr. Spilhaus suggested that the trade should be invited to state what contracts they had, and the change could come into force on the 1st July this year, the graders being instructed to grade under the old system where contracts necessitated this being done.

Item 6—

MOISTURE.

Mr. Andersen suggested that the Chief Inspector of Grain should circularize farmers and advise them of the advantages to be gained by using moisture testers.

Mr. Spilhaus agreed. Merchants would be only too willing to assist the Government in this matter. The grain could be tested at the ports and the graders could keep a note of the results.

Mr. Marwick suggested that the amount of moisture allowed should be increased.

The Chief Inspector of Grain opposed any change in this direction. He thought the matter should be left over for another year. In the meantime further experiments could be undertaken.

Item 10—

GRADING.

The Chief Inspector of Grain thought that grading should be performed on a sample taken from the truck load instead of grading each bag on its merits. The present system was too cumbersome and involved too much handling of the bags.

Mr. Clinch thought that the same facilities as are granted at Capetown should be granted at Durban, or else the former place should be placed on the same basis as the latter.

Mr. Spilhaus said Capetown had better facilities than Durban He could not agree that graders should grade on the average sample taken from the trucks. If that system were introduced the up-country man would lose and the buyer in Europe get better mealies than he paid for or vice versa. It was just as bad to make the actual shipment above the quality as to make it below. They wanted uniformity, and if they sent Home mealies that were above the grade marked in one consignment and the subsequent shipment was only just up to grade the buyer would say it was not as good as he had last time, and so trouble would ensue. If Durban had not the same facilities as Capetown, Durban should get them. The principle of grading on the truck load was bad, as the grader would use that as a means of evading his responsibility. Every bag should be graded on its merits.

Mr. Honey inquired whether Mr. Spilhaus thought that in any trade every bag was sampled. South Africa shipped two million bags: was every bag sampled?

It was explained to Mr. Honey that every bag was graded on its merits under the present system.

Mr. Ruffel agreed with the proposal of the Chief Inspector of Grain. It was unnecessary to sort out 100 bags of maize to get at two bags of a superior quality or to disturb a large quantity of yellow maize to take out two sacks of mixed grain. No buyer in the world who bought a parcel of 5000 bags of mealies would expect to get them as if they had been cast in a mould; they made allowances. They made such allowances in the produce trade in South Africa and they did the same in Europe. If the export increased it would be impossible to grade as they graded at Capetown.

Mr. Spilhaus explained that at Capetown the bags were lifted out of the truck in the shed, each bag being placed on a labourer's back. The grader then put his tester in, called out the grade, and the bag was marked and stacked accordingly.

Mr. Clinch said they would never get through their work at Durban if they did the same there.

Mr. Andersen said information should be obtained as to the cost of handling at Capetown and at Durban, and if it cost more at Capetown they should adopt the system in vogue at Durban. He would favour the principle of compelling consignors to send each grade in one truck, and then the grader should be authorized to impose the grade on the truck of the lowest quality it was found to contain. This would be a penalty which would make the senders more careful.

The Chairman explained that the real reason for grading each bag was because they had had so much trouble with wet mealies. One

wet bag would spoil a whole load. Sometimes a bag contained something that was not mealies at all; for instance, peas had been railed as mealies.

Mr. Joubert thought the Chief Inspector's suggestion a good one, if below grade mealies were taken out before grading on the truck. He would not mind superior maize being passed as the lower grades but not vice versa.

Mr. Sinclair said the Transvaal section of the Chamber of Commerce did not agree with Mr. Keet. They thought each bag should be dealt with on its merits as it had to be handled in any case.

Mr. Spilhaus also thought the principle of grading on each bag should be maintained.

Mr. Ruffel instanced the case of an up-country farmer who sent down say 100 bags of F.A.Q. Yellow; if there were ten bags of choice amongst these would the coast agent pay the up-country man the difference in price? He thought not.

Mr. Sinclair said consignments were sold as passing the grader and the grower got the price of the grade he sent.

Mr. Spilhaus again urged the necessity for keeping shipment uniform. They did not want them below the standard or above it.

The Chairman said they had had an interesting discussion but he thought the matter might now be left to the discretion of the graders.

Mr. Clinch asked who was going to bear the cost of sorting at Durban. Capetown got its sorting done free of charge. The cost of grading did not justify the extra handling in sorting.

Mr. Andersen thought the man who sent maize down in mixed consignments should bear the cost of sorting. He proposed that the principle of grading each bag be maintained and that uniformity be brought about at the several ports.

After further discussion, it was resolved:

"That the principle of grading each bag be maintained, and that uniformity be brought about at the several ports."

Item 11—

STANDARD SAMPLES.

The Chief Inspector of Grain suggested that the samples for the ensuing season should be selected from the last year's graded samples. He had brought a bag of maize with him; it consisted of samples taken from 20,000 bags graded during the past season.

The Chairman remarked that this was a very important question.

Mr. Clinch opposed the selection of samples taken from last year's grading. The standards sent to England were supposed to be the actual season's crop.

Mr. Joubert agreed with the Chief Inspector. The description remained the same, and the samples were not worth much. Buyers work on the description and not on the sample, and he really thought there was very little difference whether the samples were taken from the last year's crop or the new crop.

Mr. Sinclair inquired whether it was absolutely necessary to send samples home for the trade. Did they not know the class of maize South Africa had to dispose of? It would be manifestly unfair to send types of last season's maize to serve as standards for the coming season.

Dr. Nobbs explained the system on which Rhodesian grain was sold in Europe. They sold on sample.

Mr. Spilhaus explained that in Australia the samples were supplied about two months after the season started. He suggested that type samples be sent.

The Chairman inquired whether there was not any necessity for sending types to England.

Mr. Ruffel thought not. If they could send samples before the season commenced it might be desirable, but as they could not do that, he thought no useful purpose would be served by sending samples.

Mr. Clinch suggested that each shipper could send his own samples.

Mr. Marwick agreed with Mr. Clinch if samples were required. The samples of W.F. 1 sent the previous year were anything but choice.

Mr. Ruffel proposed that type samples should be distributed on application as soon as possible.

Mr. Spilhaus proposed as an addition to Mr. Ruffel's motion that information be circulated that maize will be graded according to the last year's descriptions, and that Round White, Round Yellow, and Flat Yellow should be graded according to the descriptions of the 1910 Round White No. 2, Round Yellow No. 2, and Flat Yellow No. 2 respectively.

Mr. Sinclair seconded the amended proposal.

Mr. Clinch thought the Chief Inspector of Grain should make up any samples which might be required.

The Chairman thought each port should retain samples of consignments graded so that it would be seen that each port graded in the same way.

The Chief Inspector explained that that had been done since he took office.

After further discussion, the Chief Inspector of Grain stated that any maize, not being unripe or musty, which did not come up to the description would be graded as Below Grade.

After further discussion, it was resolved:

"That type samples of the new crop should be distributed as soon as possible, and that information be circulated that maize will be graded according to the last year's descriptions, except Round White, Round Yellow, and Flat Yellow, which should be graded according to the descriptions of the 1910 Round White No. 2, Rou d Yellow No. 2, and Flat Yellow No. 2 respectively. Resolved further, that the samples be made up by the Chief Inspector of Grain."

After further discussion, it was resolved:

"That the price to be charged for the type samples should not exceed five shillings per one pound set."

Item 12—

GRADING OF PRODUCE OTHER THAN MAIZE OR KAFFIR CORN.

The Chief Inspector of Grain put forward the suggestion that all products enjoying the export railway rate should be graded.

Mr. Spilhaus thought the grading should still be optional.

After discussion, it was resolved:

"That products other than maize or kaffir corn should be graded on application."

Item 13—

BY-PRODUCTS OF MAIZE.

After discussion, it was thought desirable that by-products of maize should not be graded. They were sold on sample.

Item 14—

STATISTICS.

Mr. Sinclair thought the statistics should be from the 1st July to the 30th June, instead of the calendar year.

Mr. Ruffel hoped crop forecasts would be available. Statistics of production were very necessary.

The Chairman said the Government was giving this matter its attention. Every ten years, as this year, they hoped to get the figures from the Census returns.

Mr. Spilhaus thought such unreliable statistics as were available now were exceedingly undesirable. They were invariably wrong, and merely led people to do foolish things. It was better not to have statistics at all than to have incorrect ones.

The matter then dropped.

Item 15—

AMENDMENT OF REGULATIONS.

The Chief Inspector of Grain suggested that the regulations should be amended to provide for the case of grain which arrived at the port sound, was graded, and thereafter developed weevil.

After discussion, it was resolved:

"That in the event of grain developing weevil after it has been graded, the owner thereof shall, upon receipt of notice thereof from the grader, remove the same forthwith."

Item 16 (*a*)—

STORAGE OF MAIZE AT THE PORTS.

The Chief Inspector of Grain explained that the stores at Durban had been scattered about the wharves. The matter was now rectified, a large shed having been provided.

Item 16 (*b*)—

PROPOSED PROHIBITION OF THE EXPORTATION OF KILN-DRIED MAIZE.

Mr. Sinclair said South Africa did not want to touch this trade.

Mr. Clinch agreed that there was no need for South Africa to deal in this commodity.

The Chief Inspector of Grain stated this item was placed on the agenda, because a complaint was received from Europe to the effect that kiln-dried maize had been shipped. On inquiry being made it appeared the grain in question had not been kiln-dried, but portions of the consignment had been exposed to fire and some of the kernels were charred.

After discussion, it was resolved:

"That the exportation of kiln-dried maize be not allowed, and that the graders be instructed to reject consignments containing charred grain."

Item 16 (*c*)—

STANDARD SAMPLES FROM OTHER COUNTRIES.

Mr. Sinclair thought no useful purpose would be served by getting samples from other countries. No other country could produce such good grain as South Africa. The Committee agreed.

Before concluding, Mr. Sinclair asked the Railway Administration to discontinue their present practice in regard to railway consignment

notes. He knew of instances where consignments had been paid for twice over, and he thought the Railways should insist upon one consignment note being marked "original" and the other "duplicate".

Mr. Andersen said this was a very important matter.

After further discussion, Mr. Fulton explained that the matter had been put right, so there was no necessity for a resolution.

Mr. Andersen and Mr. Spilhaus raised the question of the consignment notes being negotiable.

Mr. Fulton replied that so long as the consignment was technically in the hands of the Railways, the consignor was the owner. When advice notes were posted, Railways assumed no responsibility. The difficulty was a legal one.

After further discussion, it was resolved:

"That it is advisable that consignments of grain for export be accepted by the Railway Administration as consigned to order, and that such rail receipts be regarded as negotiable documents."

The Committee concluded its proceedings at forty-fi e minutes after four o'clock.

Cotton Cultivation.

By G. ELPHICK, Malelane Estate, Eastern Transvaal.

I HAVE prepared the following short article on the cultivation of the cotton plant in response to numerous inquiries which I have received from gentlemen residing in various parts of South Africa. The large number of inquiries which I have received in connection with this subject is very gratifying, as it shows that an interest is now being taken in the cultivation of this important plant—an importance which is enhanced by the fact that cotton is entering more and more into consumption by the peoples of the world, that the demand for raw cotton is now greater than the supply, and that prices for the raw material are likely to rule very high for some considerable time to come. Seeing that South Africa can produce mealies of a quality that compares very favourably with those grown in any other part of the world, and that land that is suitable for mealies is also suitable for the cultivation of cotton, I see no reason why we cannot in South Africa produce cotton of a quality in every respect equal to, or even better than, that of the United States of America, and my suppositions have been borne out by the reports on samples of cotton taken from our own trial plots at Malelane. Moreover, cotton makes a splendid rotation crop with mealies, and I would suggest to those going in for this rotation of crops to manure the land with the mealie crop, i.e. drill in the mealies with artificial manures and, if possible, lime the land. Nearly all South African soils are deficient in lime, and lime enters largely into the composition of both mealies and cotton. If it is practicable, i.e. to purchase lime at a reasonable rate (say 50s. to 60s. per ton), put in two tons per acre. This dressing will last at least six or seven years, and probably very much longer. My reasons for dressing heavily with lime are that the chemical changes are very much more pronounced beneficially with one heavy dressing than with two lighter ones. The method I like best of putting on the lime is to draw it on the field in wagons fresh from the kilns, put it in little heaps, and allow it to rest for, say, two weeks to thoroughly air-slack, and then spread evenly with a shovel, and plough it under as shallow as possible as early in the year as one can do so; then, say, early in August plough the land as deeply as possible for the mealie crop.

We will now suppose the mealie crop to have been harvested. Our methods of cultivation for cotton are then as follows:—The old mealie lands are thoroughly harrowed and ploughed at once about 3 inches deep, and the land dressed down as fine as possible and allowed to rest until August, or even September. With us, as our seasons are late, this shallow ploughing is done for two purposes:—First, to cause as many of the weed seeds to germinate as possible, when they are turned under before seeding with the deep and final ploughing for the cotton in August; and, secondly, to form a thin, loose mould blanket to retain the moisture in the soil. The final

ploughing in August should be done as deeply as possible, and care should be taken to see that all the land is ploughed. Personally, I like the disc plough for this purpose, as it leaves the land perfectly flat and broken down and not so much surface is exposed to the sun, therefore evaporation is considerably less than with land ploughed with the ordinary mould-board plough. We use the Robinson six-furrow, stump-jump disc ploughs, as our ground is full of stumps. Undoubtedly this Australian-made plough is one of the best on the market at the present time, it being very heavy and well constructed, and the stump-jumping arrangements acting perfectly. Very few breakages occur. We have tried most other makes, but they are all too light for the work and will not stand up against it in our heavy and compact soils. We use these disc ploughs set to cut a 6-inch wide furrow, as, in practice, we find they do better work and plough deeper and take less pulling set at this width than at any other. We find a span of fourteen oxen quite ample for these six-furrow ploughs.

As soon as the rains set in we dress down the land with, first, a disc harrow and then tine harrows, and roll if necessary to get a fine seed bed. We then drill in the cotton seed, the rows being set to 40 feet apart.

Now, a few words as to drills. I must say we like the new Bradley two-row planter, fitted with interchangeable cotton-seed and mealie planting arrangements, also fitted to drill in artificial manures at the same time. I interviewed Messrs. Bradley's representative when in this country as to a supply of these machines being stocked here, and now I understand that Messrs. T. W. Beckett & Co., of Pretoria, have a supply of these machines ready for delivery.

Should the land be good and suitable the cotton plants must be thinned out to 3 feet between the plants in the row. This should be done when the plants are, say, some 6 inches high. If the land were in good order and moist at the time of sowing, the seed will sprout at once and be up in about five days, and ready for thinning in from ten to fourteen days from drilling. As soon as any weeds begin to show put the hoes in at once, or after rains. As soon as the land will bear it put the hoes in to break up the crust of the soil and thus prevent evaporation. This preserves the soil moisture, and cotton will by these means stand a drought from six weeks to two months. We use a light horse-hoe for this purpose and work single oxen. The single-yoke arrangement is our invention and we make it ourselves; we find it answers much better than the collar and leather traces made for working single oxen. From time to time it is advisable to hand-hoe the weeds between the plants and cut up any missed by the horse-hoes, for it must be borne in mind that a cotton field must be as free from weeds as possible, for, firstly, to grow weeds is a waste of manure and of soil moisture required for the cotton; and, secondly, the dried leaves and trash from weeds are likely to get mixed up in the raw cotton when the bolls burst and damage the sample.

As soon as the cotton plants begin to flower and the young bolls form all work must cease in the field, otherwise great damage might occur, the flowers and young bolls being easily knocked off. In about four to five months after drilling the bolls will begin to burst and ripen off, the raw cotton showing in round white balls. These should be picked as soon as they have dried off and hang well down out of the pods, and care must be taken by the cotton pickers not to get any dried

leaves or trash mixed up with the raw cotton. Ginning will not take this trash out, and buyers make a great fuss over dirty cotton, knocking down the price considerably. Coarse, white linen or cotton apron bags, slung round the neck, are used by the pickers so as to leave both hands free for picking. These bags are emptied at either side of the field into long wooden trays with bottoms made of ½-inch wire netting, or on to sail cloths or wagon covers, and the contents spread out evenly to dry in the sun. The cotton takes about a day or a day and a half to dry, and care should be taken to cover up these trays or sail covers at night to prevent the dew or rain wetting the raw cotton. The raw cotton should then be packed in wool-bales and taken to the factory for ginning.

In this article I do not propose describing the ginning processes, as I take it that growers—unless on a very large scale—would not go to the expense of a ginning and baling factory; in fact, it would not pay them, and is a business altogether outside farming. If farmers will only grow the cotton, merchants will very soon put up the necessary factories in their districts for ginning the raw product, baling, shipping, selling, etc. In fact, we ourselves are ready now to do this for any of our customers who care to send us their crop of raw cotton. We also hope, as soon as the industry warrants it, to put up oil mills for treating the seed, as the seed of the cotton plant produces a very fine oil greatly used in the manufacture of soaps, etc.; also, the residue makes a most excellent feeding cake for all kinds of stock. I may mention that our charges for receiving the raw cotton at Malelane Station, ginning, baling, marking, and putting the bales of ginned cotton on rail at Malelane Station and consigning to our customer's order amount to one penny per lb. of cotton.

We also shall be pleased to supply any one wanting seed-cotton for planting—good, new, acclimatized cotton seed as grown by ourselves—at threepence per lb f.o.r. Malelane Station.

I have said nothing about the yield of cotton per acre or the costs of cultivation, etc., or the probable profits, as these vary so much according to district, price of labour, etc. Moreover, this information has been given repeatedly in the various South African agricultural journals. As to costs of cultivation, however, growers can reckon them as about the same as for a mealie crop, but the picking must, as I say, vary considerably in cost according to the value of native labour in each district. We use for our pickers all young native girls and women, and have now at work between thirty and forty. These we pay, according to age and capability, from threepence to sixpence per day each, giving them their dinner, i.e. mealie meal porridge or boiled mealie cobs, whichever they prefer.

I must mention that the pickers must not start work in the morning until the dew is off and the cotton quite dry. The same applies of course after a shower of rain.

The trays we use are 12 feet long and 3 feet wide at the bottoms, which are covered with ½-inch wire netting. The sides are 18 inches high, sloping out to 4 feet at the top, and are placed on trestles 2 feet high. The trays are very much better than sail cloths, etc., as the netting allows the air to draw up through the cotton, and also permits any dust, dirt, and insects to fall through. These trays are very easy to make. They may be made out of floor boards and ordinary 3 feet

wide wire netting, with a few cross-bars at the bottom to hold up the netting.

The cotton is trodden into the wool bales in exactly the same way as wool is packed, only great care must be taken to see that the cotton is thoroughly dry before baling, otherwise it will heat and go afire. I do not know of any material that heats and goes afire so quickly as raw cotton. Being very inflammable, care must be taken if any lights are used about it.

As soon as the picking is over it is advisable to at once cut down the bushes and burn them on the land so as to destroy all insects, etc., and lightly plough the land in readiness for deep ploughing for the mealie crop. As I said before, cotton is one of the best rotation crops for mealies, as it helps to clean the land and also enriches it with humus.

In conclusion, I may say that I shall at all times be only too pleased to give my experience to any one interested in the cultivation of cotton, and it will afford me great pleasure to show any one over our estate at Malelane.

The Date Palm.

By EUSTACE PILLANS, Government Horticulturist (Cape).

MANY date palms have of recent years been raised from seed and planted out in the dry sandy districts of the Cape Province along the course of the Orange River, and these give evidence of strong and healthy growth. Several of these are already in bearing, producing, in some instances, very excellent fruits. A considerable number have lately been raised at Pella under the directions of the Resident Magistrate there. Numerous inquiries have consequently been made as to the methods of propagating and treating the palm. The following notes have been extracted from the reports of growers, which will be of interest to those intending to go in for the date palm industry, where conditions are suitable.

The date palm, to be successfully grown, needs intense heat, excessive dryness of the air, absence of rain for months at a time, especially during its growing season. Hot and dry winds are advantages rather than drawbacks to the date palm. This palm has the power of resisting large amounts of alkali in the soil, hence does not mind the ordinary brak and sandy soils so frequently met with in the dry regions. The best commercial variety is the Deglet Noor. The Rhars is a good early date for cool climates; the plant is vigorous, bears while young, and the fruit is exceedingly sweet and tender skinned. The Teddala is also a good sort for a cool climate. The fruit of this variety is larger than that of the Rhars. It attains a size up to three inches long, is a vigorous grower and prolific bearer. Some varieties of the date require practically no curing but dry on the bunch quite fit for use.

The proportion of male palms in commercial groves should be one to one hundred; it is, however, advisable to have one to fifty.

The blooms in spring should produce six to twenty flower clusters; each flower cluster on a female palm produces fruit. A bunch bears from 10 to 40 lb. of dates. Vigorous trees are allowed to carry eight to twelve bunches.

Seedlings are not the best means for propagation, offshoots are preferable, as they withstand more alkali in the soil than seedlings. Also the date does not always reproduce true to type from seed, unless the female flowers are protected after fertilization.

Offshoots should be set out where they are from three to six years old, not earlier. These should be planted in the early summer when the soil is warm and be kept moist continually during their first season.

In soils where a considerable quantity of alkali is present and rises to the surface young palms do not thrive well. Assistance may be given them by enclosing the spot where each one is planted with a wall of sand; into this the fresh water should be put and the surface covered a foot deep with grass or straw, so as to prevent evaporation and rise of alkali.

Plants should be set out 26 to 33 feet apart, giving sixty trees to the acre. The land between the young trees may be cultivated and crops taken from it during the first ten years of the trees' life.

Offshoots, under proper conditions, usually produce fruit in their fourth year and should be in full bearing in their eighth or tenth year. Palms continue bearing up to 100 or more years of age. A good tree will produce from 60 to 200 lb. of fruit per annum.

Pollination.—One twig of male blossoms extracted from a cluster should be inserted into a bunch of female flowers and tied thereto; this will be sufficient to pollinate the whole bunch. Pollen may be preserved in a cool dry place, and it will remain active for fully twelve months.

Stock Shelter and Fencing Timber.

TREES SUITED FOR THE ELLIOT DISTRICT.

A CORRESPONDENT residing in the Elliot District, Cape Province, has asked for information on the following subjects, viz.: Which is the best wattle to plant for stock shelter, taking into consideration quickness of growth and length of trees' life (his altitude being about 4800 feet). He also asks if black wattle poles will stand any length of time in the ground if previously well painted with coal-tar. In reply to these queries the Acting Chief Conservator of Forests has furnished the following information:—

Silver Wattle (*Acacia decurrens*, variety *dealbata*) is a good stock shelter and less susceptible to frost than either Black Wattle (*Acacia decurrens*, variety *mollissima*) or Green Wattle (*Acacia decurrens*, variety *normalis*), which are also good stock shelters.

Without an inspection it is not possible to say with any degree of certainty whether these wattles will thrive owing to frost at Malvina. They grow freely at higher elevations than that mentioned, viz., 4800 feet, but there are other factors to be taken into account, such as soil and aspect. It is considered that the best plan in correspondent's case will be to try an experiment of all three wattles with the following points as a guide: (1) The site must be in good fresh soil that has never been cultivated previously, on a warm and not exposed aspect away from any frost hole. (2) The sowing must preferably be conducted in autumn rain, viz., March or April. (3) The seed must be put into boiling water and allowed to soak for two or three days prior to sowing, and must not be covered by more than its own depth in the soil. (4) In the following autumn the area should be well hoed between the rows to kill all weeds and aerate the soil to enable the young plants to be in a better position to combat the winter frosts. Further hoeings in the succeeding autumns would be beneficial but not a necessity.

The rainfall in the Elliot District is good, and if these conditions are adhered to there is little doubt that the experiment will be a success.

Wattles are known to be cut down by frost in various parts of Elliot District, but I am of opinion that they must have been given unfavourable conditions.

It is impossible to lay down the life of a Black Wattle pole well painted with coal-tar, but in some soils and localities it will last longer than in others.

The pole should be cut when mature (wattles mature in some soils and localities sooner than in others) and when the sap is down.

Probably a wattle pole grown in average conditions, and likewise so planted in the ground, cut when mature with the sap down, and if previously well painted with coal-tar, would last about ten to fifteen years.

Agricultural Show Season, 1911.

Photo: T. Brittain.

Group of Hereford Cattle from the Government Stud Farm at Standerton.
Winners of the Hundred-Guinea Dunne Cup at the Witwatersrand Show.

Agricultural Show Season, 1911.

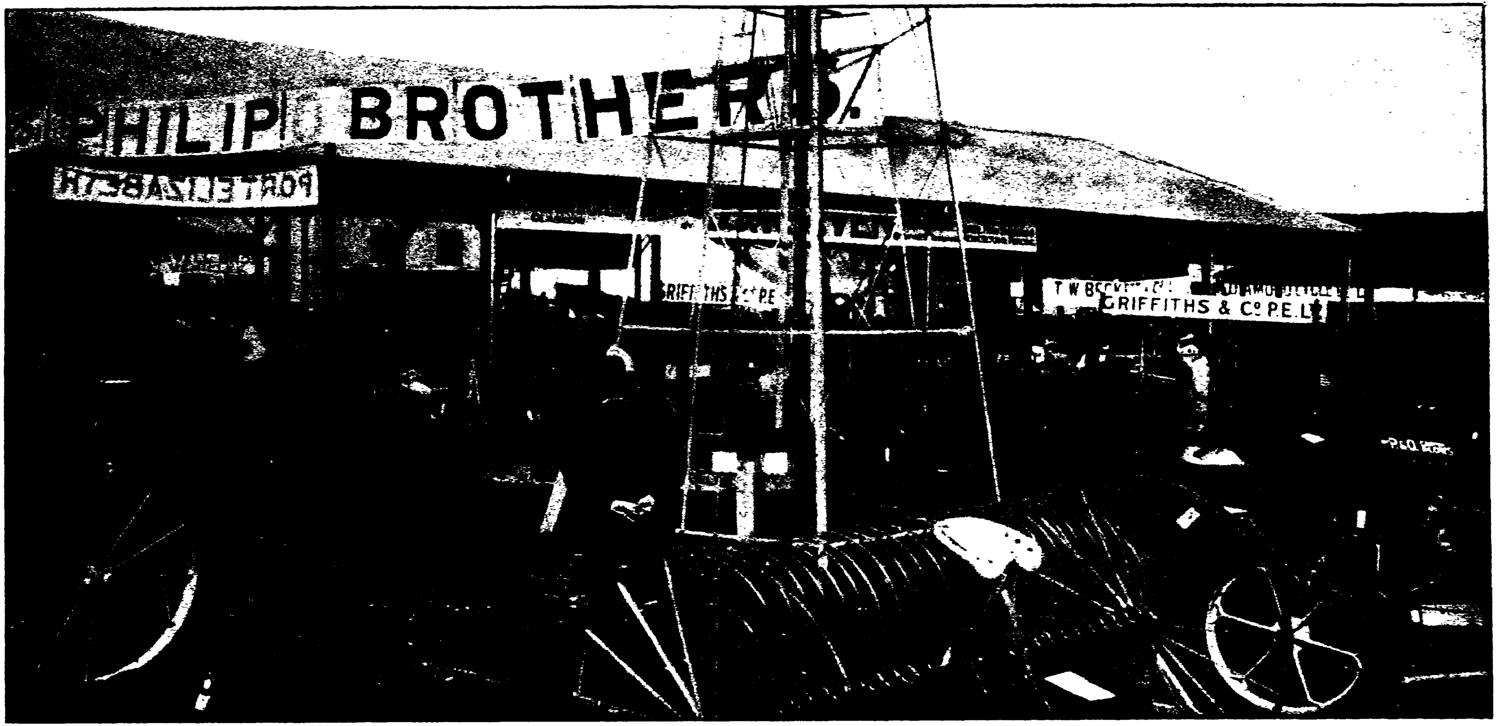


Photo: T. Brittain. Among the Implements at the Witwatersrand Show.

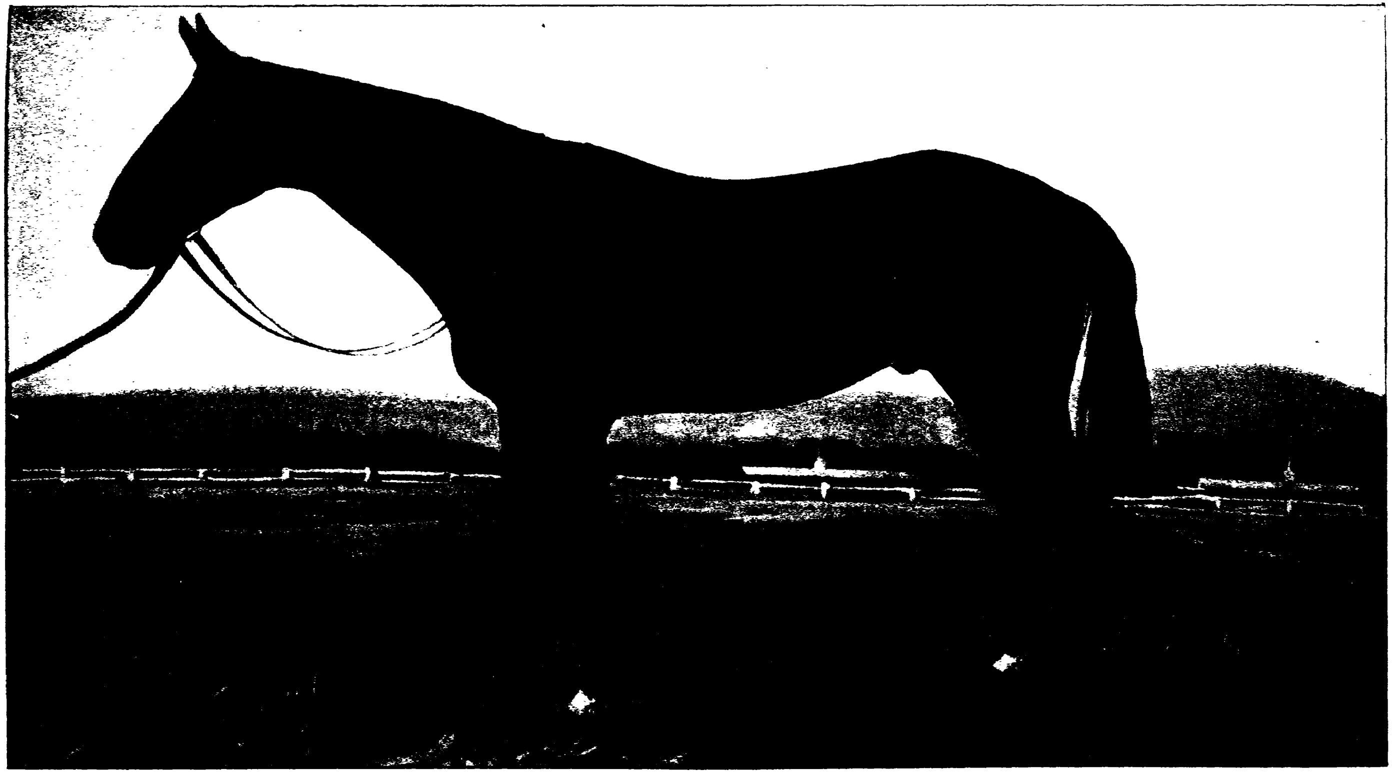
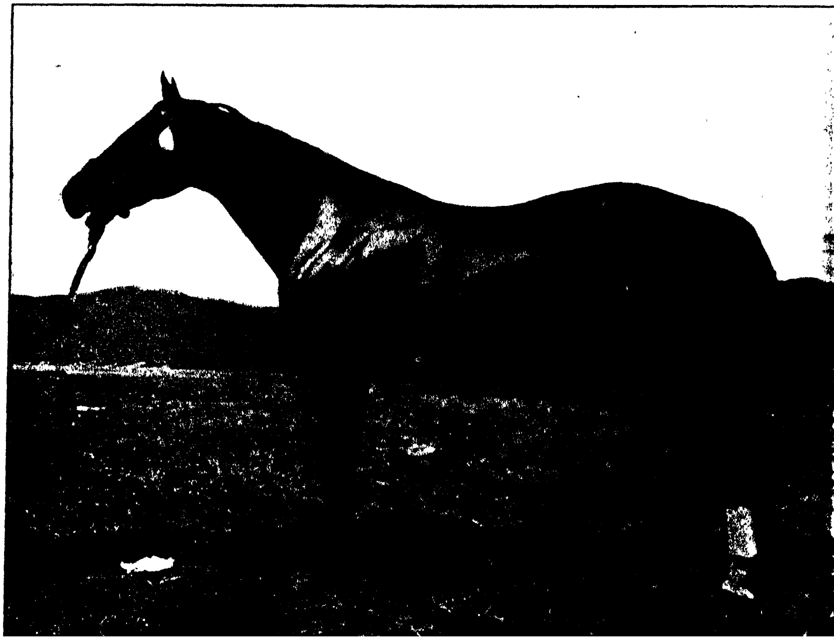


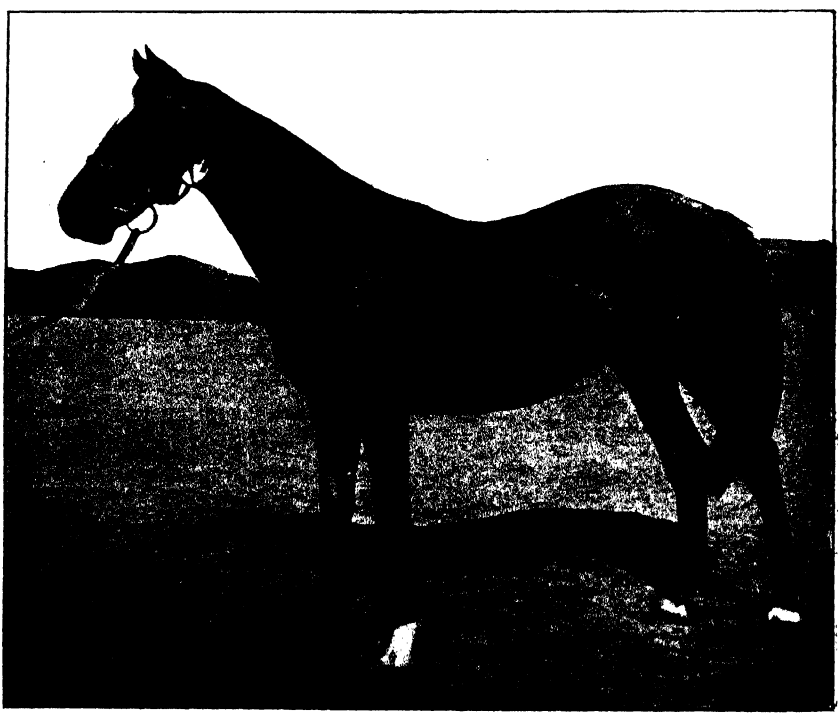
Photo: T. Brittain.

"Sarcelle", Champion Thoroughbred Stallion, Witwatersrand Show.
The property of Mr. Lionel Phillips.



"Chesney", Thoroughbred Stallion. 2nd at Bloemfontein and 2nd at Witwatersrand. The property of Messrs. Anderson Bros.

Photo: T. Brittain.



Champion South African Thoroughbred Yearling Filly at Witwatersrand Show. Bred and owned by Senator the Hon. Chas. Southey. By "Patron Saint".

Photo: T. Brittain.

Photo: T. Brittain. Mr. R. Morton's Clydesdale Stallion, "Scotland's Pride" Witwatersrand Show.

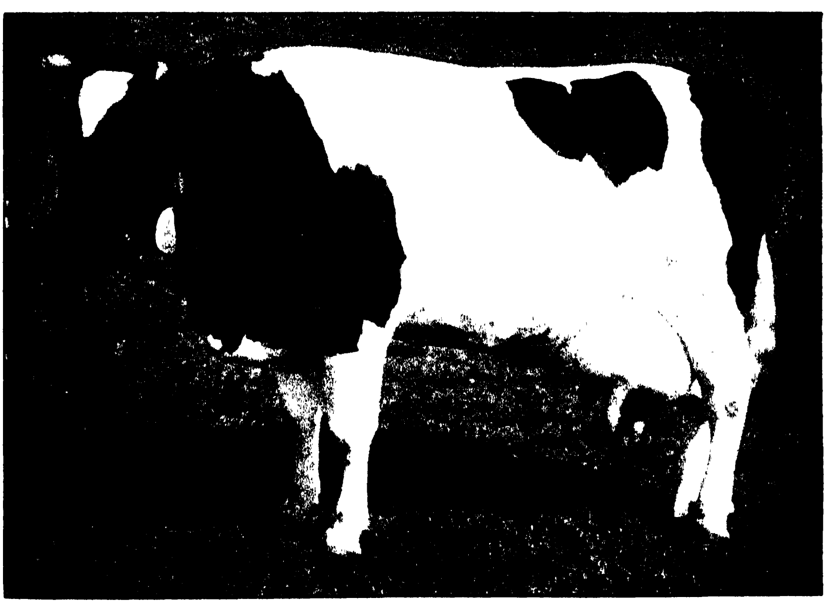
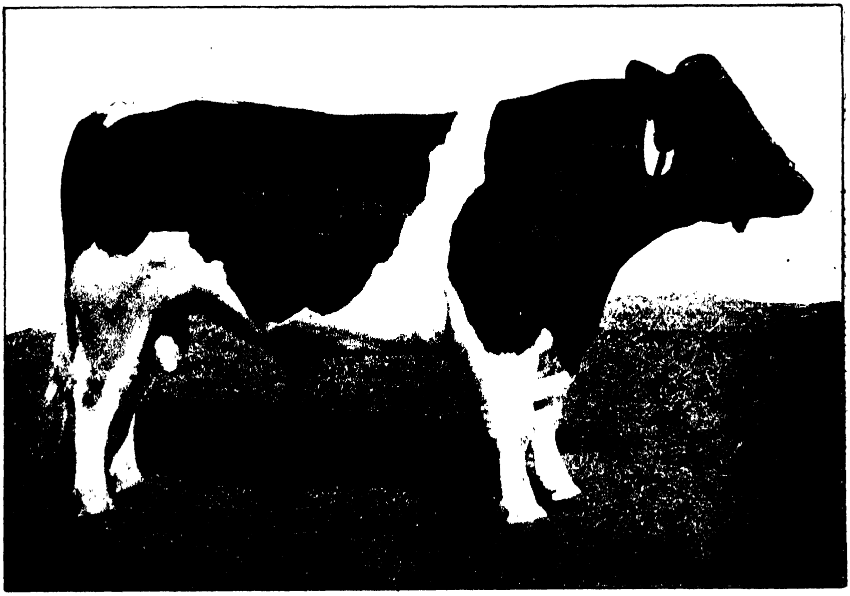


Photo: T. Brittain. Best Milker in the Yard, Witwatersrand Show. Owner: Mr. J. T. Tulley.

Agricultural Show Season, 1911.

1. Mr. F. L. Duminy's Friesland Cow. 1st, Transvaal bred, Witwatersrand Show.
2. Messrs. Hoggett & Oven's Shorthorn Bull, "Clinker". 1st, Transvaal bred; and 2nd, Open class, Witwatersrand Show.
3. Mr. F. L. Duminy's Friesland Bull. 1st, Colonial bred, under four years, Witwatersrand Show.

Photo: T. Brittain.



Champion Friesland Bull "John", Witwatersrand Show.
Owner: Mr. J. J. van Niekerk.

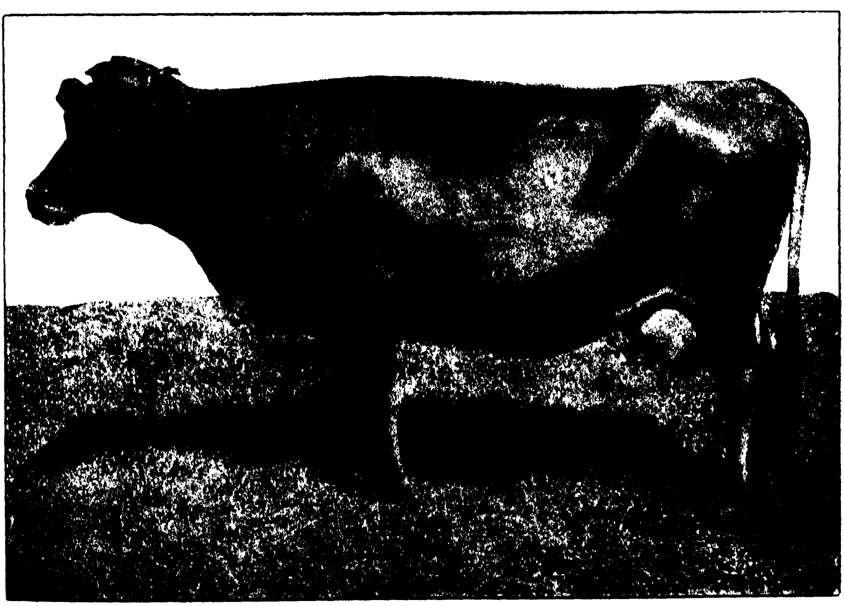


Photo: T. Brittain.

Mr. J. Ackermann's Jersey Cow.
Winner of Two Firsts at Witwatersrand Sh

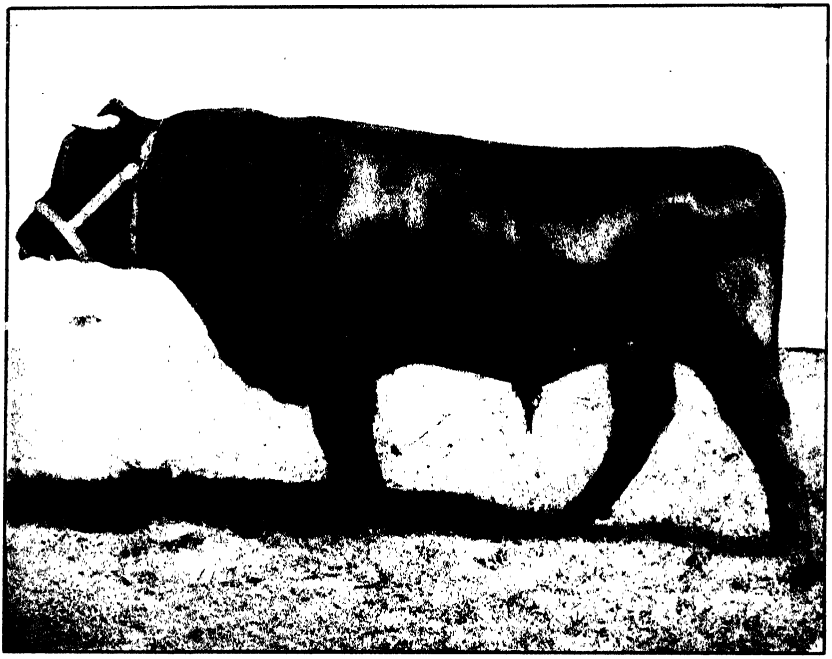


Photo: T. Brittain.

Champion Shorthorn Bull, Witwatersrand Show.
Owner: Sir Geo. Farrar.

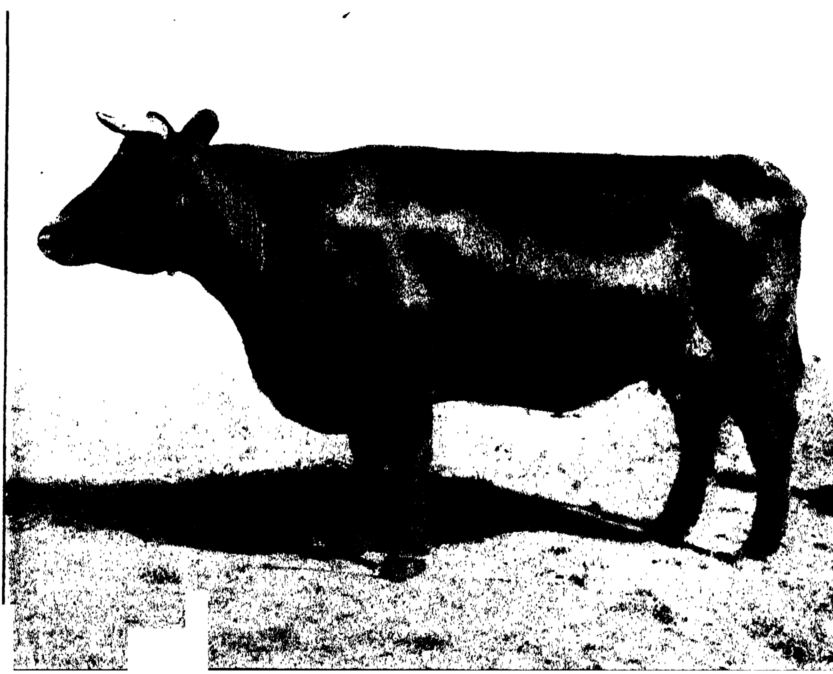
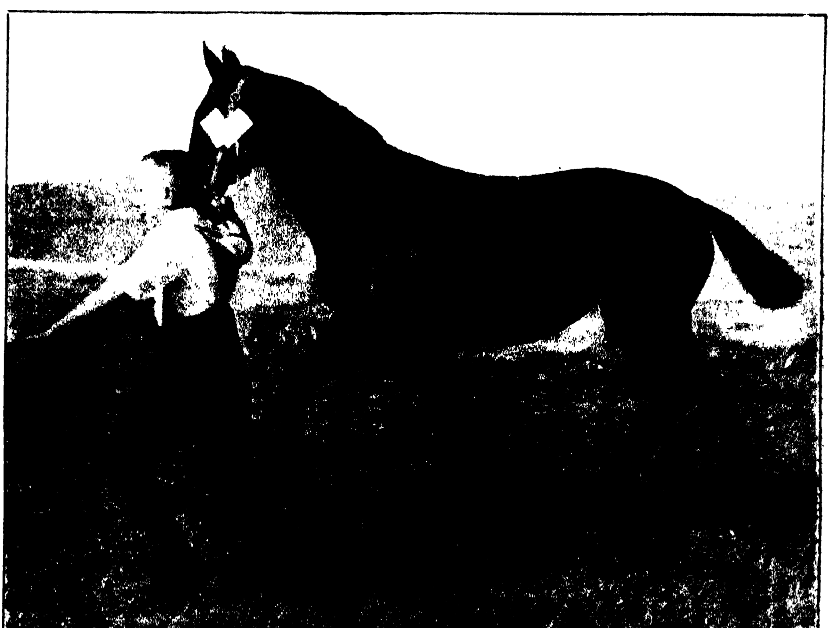


Photo: T. Brittain.

Champion Shorthorn Cow, Witwatersrand Show.
Owner: Sir Geo. Farrar.

Agricultural Show Season, 1911.

"Lord Donnington", Hackney Stallion. Champion at Robertson and Worcester.
Photo: A. Keyzer. Owned by Mr. W. D. Malherbe.



"Moss Rose", filly of above; dam, Hackney Mare, "Jewel".
Photo: A. Keyzer. Owned by Mr. W. D. Malherbe.

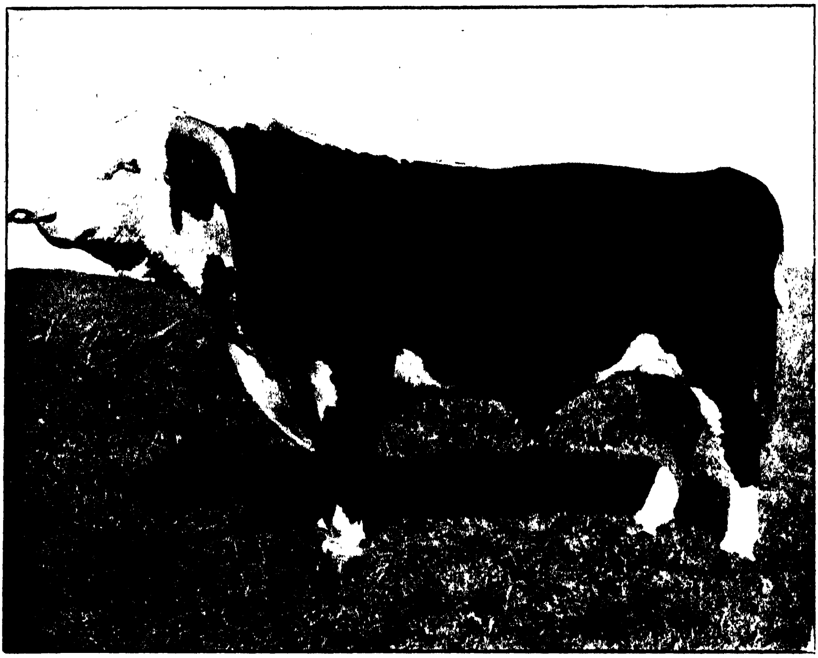
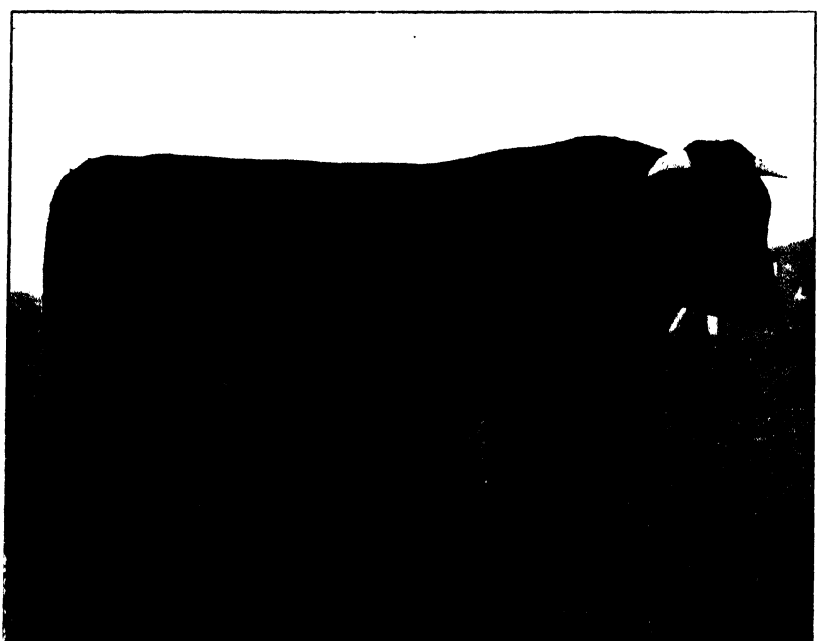


Photo: T. Brittain

Mr. C. H. Spencer's Hereford Bull.
1st, Open class, Witwatersrand Show.



Champion South Devon Bull, Bloemfontein.
Owners: Messrs. Grepe and Raby, Devon Farm, Dewetsdorp, Orange Free State.

The Mederer Preserving Chamber.

RESULTS OF DEPARTMENTAL EXPERIMENTS.

IN a late number of the *Transvaal Agricultural Journal* Mr. R. Pape, Superintendent of Dairying, published an interesting article entitled "Preserving Perishable Produce", in which he drew attention to and discussed the merits of the Mederer chilling chamber for cold storage purposes. The article was reprinted as Farmers' Bulletin No. 128 of the Transvaal Department of Agriculture. The various experiments carried out by Mr. Pape led him to the following conclusions:—

1. The Mederer preserving chamber, by its special construction, quite apart from the temperature conditions, considerably retards decay by certain germicide properties.
2. The air current inside the chamber is rapid enough to carry off vapours emitted before they have an opportunity to contaminate perishable produce in the chamber.
3. A certain fixed relation exists between the rapidity of the air current in the chamber, the moisture contents of the outer air, and the preservative action of the chamber. If the air current is stopped or the moisture content of the outside air rises to 100 per cent., the special preservative action of the chamber. independent from temperature conditions, is stopped.
4. In order to secure the special germicide action of the chamber it is very important that the construction be perfect and that the amount of moisture used be regulated with extreme care. A faulty construction and an ill-regulated water supply will affect the efficiency of the chamber very materially.

The publication of Mr. Pape's article led to a succession of other experiments in connection with the preservation of fruit and meat. The following extracts from the reports of the Government Horticulturist and the Junior Assistant Chemist of the Department of Agriculture are of interest as illustrating the great utility of the Mederer chamber, so far as high veld conditions are concerned. Whether it will prove as valuable in the humid atmosphere of the coast remains to be seen.

EXPERIMENTS WITH FRUIT.

The Government Horticulturist reports that the actual work done gave the following results:—

On 28th September, 1910, the undermentioned items were placed in the chamber, viz., seventeen lemons (cured by Messrs. Flanagan Bros., Komgha, Cape of Good Hope) possibly this fruit had been picked for two months; one box asparagus, from Vereeniging; six boxes naartjes, six days from trees in Natal; eighteen apples (Rokewood), imported from Australia (these had been some time previously in cold storage).

Inspection of the above, after the lapse of seven days, showed lemons, naartjes, and apples in perfect condition; asparagus shrivelled and useless. At the same time sixty-four oranges were placed in the chamber and two large pawpaws from the Government Experimental Orchard, Warmbaths.

Examination on the 14th showed that the naartjes which were in boxes unopened had commenced to succumb to blue mould, an average of three per box having rotted in each case. The boxes were therefore left open with the wrapped fruit fully exposed to the atmosphere of the chamber. A check of naartjes which was not placed in the chamber was rotten to the last fruit. The asparagus was quite dry, sweet smelling, but useless. The apples were in good condition, but commencing to be attacked by mice. The lemons and oranges were in good order. The two pawpaws placed in green on the 4th instant were turning yellow.

Inspection on the 20th showed apples, oranges, and lemons all sound; naartjes showed an average of one per box destroyed by blue mould. The remainder were then taken out of the boxes, unwrapped, and laid out on a shelf. Asparagus was thrown away. Pawpaws nicely yellow but perfectly sound. A bunch of green bananas was put in.

On the 27th it was found that one pawpaw had partially decayed; the other, being in excellent condition, was removed and eaten. The flavour was excellent. Apples, oranges, and lemons were in good order. Some of the lemons which had remained wrapped in paper were more shrivelled than others fully exposed to the atmosphere, so the wrappings were all taken off. Naartjes were in perfect condition and of good flavour and juice contents. Bananas had turned black and were thrown away.

No further inspection was made until 10th November, and on that occasion the chamber was out of order and the water-pipes choked; no humidity whatever was present. The last apple had been eaten by mice. The lemons, naartjes, and oranges, however, remained in good order, the lemons showing a little more inclination to shrivel.

24th November: Lemons rapidly drying, oranges in the same condition, but the naartjes remained in good order. A box of oranges and one of lemons from Natal were placed in on the 22nd, and three boxes of apricots from Pienaars Poort.

8th December: Natal lemons, unwrapped, placed in chamber on 22nd November, all succumbed to blue mould, but oranges (Du Roi) sound. Original naartjes were still in good order. Apricots, put in in half ripe condition, in good order but ripening. Three boxes of Chinese peaches were put in.

12th December: Two boxes of apricots sent up from Potchefstroom were also attacked by mice. The one untouched remained in good order.

22nd December: One box Satsuma plums put in.

29th December: Naartjes drying and unfit for sale. A few oranges in fair order. Of the apricots put in on the 12th, those which were wrapped were all rotten; the unwrapped box was still sound but going soft. The check boxes lasted ten days only. Red Negate plums, put in 14th, sound; the check box of these kept good for fourteen days. The Satsumas put in 22nd were commencing to rot.

7th January, Mr. Van Spyk being compelled to leave Johannesburg for a time (the three months' trial having come to an end),

all the fruit were taken out of the chamber. The naartjes, though dry, were sound; the oranges were also dry and sound, but all the plums and apricots had rotted.

EXPERIMENTS WITH MEAT.

The Junior Assistant Chemist's report is as follows:—

I went over to Johannesburg on the 6th October and arranged for the supply of meat for this experiment with Mr. Van Spyk.

At 6 a.m. on the 7th, Mr. Van Spyk and I chose fat tail mutton that had been killed on the 6th, taking with us four hind legs of the fattest sheep we could get (weight 24 lb.). These four legs were placed in the Mederer chamber at the show ground. The inside temperature of the chamber was 54° F., humidity 60°.

There were also in the chamber oranges, tropical fruit, fish (six months old), butter, mutton, and cheese (also six months old, so I was told).

On the morning of the 14th October I again visited the chamber. The average temperature for the past week had been 54° F., and humidity 62°. I found the mutton was in splendid condition, but unfortunately a large blow-fly, which had evidently obtained entrance by the door, had deposited eggs on two of the hind legs, only one egg of which was noticed at the time. The fly was killed. On the 18th instant the leg was reported to me by telephone as " going bad ", but was left in the chamber on my advice.

On the 21st October I again visited the chamber. The average temperature inside for the past week was 60° F., and the humidity 60°; outside temperature 65° F. (from 59° F. to 92° F.).

The fly-attacked leg was absolutely unfit for food; another leg also appeared to be decomposing and on being cut showed maggots due to the fly. The other two legs were perfectly sound and fit to eat after being fifteen days killed and fourteen days in the chamber; they showed a decided acid reaction, in marked contrast to the alkaline reaction of the bad legs. The loss through moisture was 10 per cent. The reason why mutton was chosen—and fat mutton too—was that this particular meat is recognized to be the most difficult to keep fresh. The " bad " legs left in the chamber showed that natural decomposition must be greatly retarded in this cool and well-ventilated chamber.

Rooi Bloem or Witchweed.

THE following letter has been received by Mr. Claude Fuller, Government Entomologist, Natal, from a correspondent :—

"You will remember some years ago seeing the mealies badly attacked with Witchweed in the valley. These lands were subsequently put under cotton, and during the two years they were under this crop there was no sign of the Witchweed. They were then put under mealies again and, curiously enough, the pest was worse than ever before. They have now been under sugar-cane for a year and, except for a few plants growing on the edges of the cane along the roadways and tramlines, there is none of the parasite in the cane. As a good deal of reference has been made to this pest in the Transvaal recently, where it appears to have only just been discovered, this information may be of interest to you.

"I would be glad of some explanation of the absence of the weed when the lands were under cotton and its abundant appearance as soon as they were again put under mealies. You might also let me know whether there is any reason for its practical disappearance in the sugar-cane, as you pointed out to me some years ago that it was equally a parasite of cane."

The following reply was sent by Mr. Fuller, and is published here as it will doubtless interest readers engaged in maize growing :—

"In reply to your letter of the 20th ultimo, I may say that my attention has been drawn to the more general interest exhibited in the Rooi Bloem or Witchweed lately in the Press of the neighbouring Provinces. I have every reason to believe, however, that it is by no means of recent origin, having been known as a mealie pest there for many years past. The first explanation of the parasitic nature of this plant was given in my report for 1899-1900, wherein it is referred to as the Witchweed or 'Isona', the native name indicating that the little red flower bewitched the mealies, and supplying the English equivalent by which it now goes.

"I have never been able to germinate the seeds of the Witchweed under ordinary conditions, and in common with certain other plants of similar parasitic habits, the seeds only germinate when a growing root of their host-plant approaches closely to them where they lie in the soil. This is a very remarkable phenomenon, and one that I believe awaits a proper explanation. Another point is that, because these seeds have to await such a fortuitous circumstance, they are endowed with great vitality. What the vitality of the Witchweed seed actually is I cannot say, but I have kept seeds for six years and they looked just as fresh as the day they were collected. In the case of an allied parasite, the seeds are known to retain their vitality for ten years, and your observations have this scientific interest that they show that the Witchweed seeds will lie in the soil for two years and then germinate when approached

closely by a mealie root ; and, further, that the roots of the cotton plant exercise no such peculiar influence over them.

" The practical disappearance of the weed now the cane is in the lands may be due to several circumstances. In the first case, cane-roots may not have the same germinating influence over the seeds, and many may still be lying in the soil. Again, they may have caused them to germinate and then thrown them off. In view of the fact that the weed is found along the edges of the cane, it is highly probable that the cane-roots caused most of the seeds to germinate, and then, when the Witchweed came up, it was unable to develop under the dense growth of the cane and was choked out. There are two points upon which there can be very little doubt, one is that the Witchweed has not that enervating influence over the cane that it possesses over the mealie, and the other is that the root-system of the cane is such that it gives an opportunity for every Witchweed seed lying in the soil to germinate.

" It is quite possible that two or three years under cane would eliminate Witchweed from any soil, but on that point I cannot speak with much assurance."

The Feeding of Equines.

By J. M. CHRISTY, Acting Assistant Principal Veterinary Surgeon (Transvaal).

IN dealing with this matter it is important to understand what is meant by a well-balanced ration, namely, a diet containing a proper proportion of nitrogenous constituents or albuminoids, called protein, to non-nitrogenous substances, called carbohydrates or fats.

The most important constituents of the food for equines are protein, carbohydrates, and fats, the proportions being about one of protein to from six to seven of carbohydrates and fats.

A ration for equines should contain the constituents required for the building up and sustaining of the body, in addition to supplying the power and energy to enable them to do the work expected from them.

In connection with this subject, Mr. Herbert Ingle, B.Sc., F.I.C., F.C.S., wrote in the *Transvaal Agricultural Journal* (Volume VI, page 51):—" It may be well to recapitulate the conditions with which the ration of an animal should comply. These are:—

" (1) It should contain protein, carbohydrates, and fat in suitable proportion for the requirements of the animals. These requirements differ somewhat according to the age, kind of animals, conditions under which they are kept, and other circumstances.

" (2) It should contain in proper quantity, and especially *in proper proportions*, the various mineral ingredients required for the nutrition and formation of bone, and for the carrying on of the various life processes of the animal."

The above was written in connection with bone disease in animals, but I desire to use it in this article as it indicates in a scientific manner the food we should give to the domesticated animals.

As I desire to make this as far as possible a practical article, I refrain from giving tabulated analyses of the various foodstuffs—which can be got from Mr. Ingle's published articles—and will simply confine myself to the undermentioned three tabulated statements and particulars as to how equines are fed in some large establishments in the Transvaal:—

SCALE OF FEED PER ANIMAL PER DAY.

Horses.—Mixed feed, 19 lb.; oats, 3 lb.
Mules.—Mixed feed, 17 lb.

This " mixed feed " is made up of 12 lb. forage and 7 lb. mealies for horses, and 10 lb. forage and 7 lb. mealies for mules. When green stuff (such as lucerne or barley) or teff hay is obtainable, an equivalent, according to price, is substituted for 2 or 3 lb. mixed feed.

STATEMENT OF COST PER HEAD OF MULES AND HORSES FOR THE SIX MONTHS ENDED 31ST DECEMBER, 1910.

	Horses.			Mules.		
July	£1	15	8.346	£1	3	8.413
August ...	1	12	10.525	1	1	3.505
September ...	1	9	11.850	1	1	3.344
October ...	1	11	8.688	1	3	4.315
November ...	1	14	1.365	1	5	10.777
December ...	1	12	1.140	1	6	7.196
Monthly average for the six months ...	1	12	8.985	1	3	8.260
Cost per head per day...	0	1	1.096	0	0	9.475

1910.					
August	248 animals for 31 days,	£321	8	2
September	288 ,, ,, 30 ,,	323	11	7
October	272 ,, ,, 31 ,,	348	4	0
		£993	3	9

Average cost per animal per day, 9⅜d.

Fed during three months (August, September, and October):—
Bran, 600 lb.; chaff (cut straw), 111,347 lb.; green forage (lucerne), 109,335 lb.; cut forage (oat-hay), 12,990; grass hay, 101,972 lb.; mealies (crushed), 220,500 lb.: total, 556,744 lb.

Average weight in food per animal per day:—
10 lb. mealies, 5 lb. chaff, 5 lb. grass-hay, 2½ lb. lucerne and bran; total, 22½ lb.

SCALE OF FEED PER ANIMAL PER DAY.

	Grain. lb.	Hay. lb.	Bedding. lb.	Salt. oz.	Approximate Cost. s.	d.
(a) Artillery and draught	10	11	8	1	1	3
(b) Cavalry	9	10	8	1	1	2
(c) Mounted infantry	8	9	8	1	1	0½
(d) Remounts	5	7	8	1	0	7½
(e) Working mules	7	7	6	½	0	10½
(f) Grazing mules when grazing is "good"	2	0	6	½	0	2½
(g) Grazing mules when grazing is "indifferent"	2	4	6	½	0	5
(h) Grazing mules when grazing is "bad"	4	8	6	½	0	8¾

The scale of rations given above is the standard one. Officers commanding units may draw green forage, linseed, bran, etc., to vary the animal's diet at their discretion, in lieu of any part of the ration, provided that the total cost of the ration is not increased. The majoriy of units give their horses a warm bran mash once a week. The grain portion of the ration is governed by the price. At stations where oats can be purchased cheaper than mealies they form the standard ration.

Wattle Bagworm Parasite.

MR. CLAUDE FULLER, Natal Entomologist, forwards the following copy of a letter which he has addressed to a correspondent in regard to the wattle bagworm parasite :—

In reply to your letter of the 9th March, covering bagworm specimens, I would say at once that the reddish-brown, egg-like objects which you extracted from the interior of the bags are not the eggs, but the chrysalids of a fly-parasite of the bagworm. This insect, excepting for its large size and somewhat bristly appearance, is in its adult stage much like the common house-fly, and the members of the sub-family to which it belongs may be regarded as first cousins to the natural group in which the house, blow, and flesh flies are gathered.

These fly-parasites are spoken of as "Tachinids", and though some are dark many are mottled with silver-grey. Their larvae or maggots commonly subsist within the bodies of caterpillars, and those of many moths and butterflies are destroyed by them. Other insects also are parasitized by them, and the maggots of one Tachinid live upon the eggs of the red-winged locust. Our local Army-worms and Sugar-cane caterpillars are most subject to their attack.

Ordinarily, the female flies fasten their eggs to the skins of the caterpillars, and these can often be observed in the form of little white dots about the neck of the insect. In such instances the maggots on hatching pierce the skin and enter the body. In the case of some species, however, the parent fly deposits its eggs upon the foliage, and these, passing uninjured into the caterpillar's stomach with its food, there hatch. Although the maggots consume the body-juices and destroy the tissues, their presence does not bring about the immediate death of the host. Such only occurs when the parasites are fully grown and prepared to enter into the pupa stage. This may be before the caterpillar itself pupates, or afterwards. So it arises that instead of the expected moth issuing from a cocoon, or a butterfly from its chrysalis, out comes a buzzing fly.

In the case of the bagworm parasite, I am not able to say where the parasite lays its eggs, whether on the foliage or upon the insect's body; both are equally probable. The maggots do, however, leave the body of the caterpillar and pupate in its domicile, and this point has an important bearing upon the economy of the fly-parasite.

In the two cases I have mentioned above, the Tachinid parasites seem to control the abundance of their hosts, the Army-worm and Sugar-cane caterpillar, most effectually, so that they are only occasionally sufficiently numerous to be destructive. The one under discussion as a check upon the bagworm is, unhappily, a negligible quantity, because just as it parasitizes the bagworm it, in its turn, is parasitized by a minute wasp. This wasp is termed a secondary parasite, because it parasitizes a parasite;

which calls to mind the familiar rhyme about the big fleas and little fleas, and the tale of the house that Jack built :—

Here is the farmer all forlorn
That planted the wattles, bagworms shorn.
Here is the fly, with wings all spread,
That struck the bagworm and left it dead.
And here is the wasp, tiny and small,
That smote the fly and caused its fall.

From what one knows of the parasitism of fly-maggots by these minute wasps, there is little doubt that the wasp enters the bag and, just as the maggots emerge from the bagworm, stabs its ovipositor into their soft bodies and therein deposits its eggs. The maggot changes into a pupa, but instead of a fly emerging therefrom about fifty small wasps make their escape. With so many to a single individual it can be imagined how effectually this bagworm parasite is under control, and easily seen how little real effect it can have upon the abundance of the bagworm.

Scale of Points for Friesian Cattle.

A CORRESPONDENT at Fish River Station asks for information regarding the South African scale of points of Friesian cattle. The General Manager of the Experimental Farm at Potchefstroom, to whom the inquiry was referred, replies that there is no official South African standard of excellence for Friesian cattle. Good judges of the breed as a rule adopt the points of Friesch Rundvee Stamboek, or the American Holstein-Friesian Herd Book, and place emphasis upon particular points applicable to the South African conditions.

The following are the points of the breed as described by the Friesch Rundvee Stamboek, and a fuller description compiled by Mr. Wibbens is appended:—

IDEAL FORM OF FRIESIAN CATTLE, STATED BY THE FRIESCH STUD BOOK.

Colour.—Black and white with a white stripe over the shoulders and one on the crupper; white star before the head, and four white legs.

Skin.—Loose, fine, and soft.

Head.—Fine, not long, eye-hole orbit large, eyes large; good-natured appearance.

Muzzle.—Blue and broad, nostrils large.

Horns.—Fine, smooth, position a little downward and bent a little forward.

Neck.—Long, fine.

Chest.—Deep and broad.

Withers.—Not broad, not narrow.

Shoulders.—Closed well to the body, not too heavy.

Ribs.—Long with a gentle curve.

Back.—Straight, open spaced.

Loins.—Moderately broad.

Crupper.—Flat; if possible, square.

Pelvis.—Broad.

Limbs.—Thighs (buttock) till the Achilles tendon straight, upright, and flat, joints powerful, flexible.

Tail.—Long, fine, with soft hairs.

Udder.—Large, fine, spongy; connected to the belly with a sloping line.

Teats.—Well developed, but not too long, and squarely placed; a blue colour of the teats is preferred, because these have more resistance against sunshine.

Milk Veins.—Swollen greatly.

DESCRIPTION OF FRIESLAND CATTLE.

(*By Mr. Wibbens.*)

Colour.—Black and white, with a white stripe over the shoulders, and one over the crupper, with a white star on the forehead, with four white legs without black spots below the knees and hocks.

Skin.—Loose, fine, and soft, with good handling qualities. People like to see the skin of the udder yellow coloured, but this has no value.

Hair.—Fine and soft.

Head.—Fine, medium length, comparatively long from eyes to base of horns, broad and dishing between the eyes, not so broad at the base of the horns, comparatively short from eyes to muzzle, eyes large; good appearance.

Muzzle.—Blue, broad, and moist, nostrils large.

Horns.—Fine, smooth, position a little downwards and bent forward and inward.

Neck.—Long, fine, and moderately thin, nearly free from dew-lap, neatly joined to head and shoulders, top line slightly curving.

Chest.—Deep and broad.

Shoulders.—Closed well to the body, long, broad, not too heavy.

Withers.—Not broad, not narrow, and even over shoulder-tops.

Crops.—Full and level with shoulders.

Chine.—Straight and open spaced.

Ribs.—Long with a gentle curve; the last ribs must be open spaced.

Flanks.—Moderately deep and full with large abdomen.

Loins.—Moderately broad.

Rump or Crupper.—Long and broad, if possible square, flat, not sloping too much, hip bones not coarse, not too prominent. American people want a high crupper bone, but it is not advisable to breed in that direction.

Pelvis.—Broad.

Hindquarters.—Buttock till the Achilles tendon straight, upright, and flat, twist open, placed fairly high, roomy, pin bones wide spaced, " bands " strong.

Tail.—Long, fine, covered with soft hair.

Udder.—Long, deep, and wide, fine, spongy, extending well forward and well up behind, with well defined veins, and squarely placed well developed teats (but not too long, blue colour, having resistance against sunshine, preferred).

Milk Veins.—Large, tortuous, preferably branched, entering the abdominal wall well forward and through large orifices.

Escutcheon.—Well defined and well developed; has not much value.

Potato Scab.

(*Oospora scabies*, Thaxter.)

By I. B. POLE EVANS, M.A., B.Sc., F.L.S.

POTATO scab is one of the commonest and most widely distributed fungous pests against which the potato grower in South Africa has to contend. The disease is readily recognized by the dark brown scaly patches present on the surface of the tubers. In some cases the scaly patches are distributed sparsely over the tuber, while in others the whole tuber is covered with a scaly or scabby surface. These rough patches are produced by the action of a parasitic fungus which attacks the tubers while they are buried in the soil, and it is through the importation of these affected tubers that the disease has been introduced into this country and then distributed from place to place. (See Plate.)

The potato scab fungus flourishes best in sandy or gravelly soils, and the addition of lime or wood ashes to such soils greatly increases the danger from scab.

Recent experiments carried out at the Leeds University show that the use of sawdust, at the rate of 5000 lb. per acre, applied over the sets at planting time greatly diminishes scab on land very subject to it. The generally received explanation of this is that the sawdust increases the water-retaining power of the soil, but the experiments alluded to hardly countenance this view, but rather suggest that the beneficial effect may be due to the avoidance of abrasions to the skin of the potato during its growth. Such abrasions are much more likely to occur in a gravelly soil, or in a soil containing ashes.

Potato scab can easily be prevented if the proper precautions are taken. Scab may be introduced into a crop in two ways, either by means of contaminated tubers for seed purposes or by the use of farmyard manure which contains the germs of the disease from potato peelings, etc. It is against these two possible sources of infection that the farmer must be on his guard.

Diseased tubers can be completely sterilized by immersing them for two hours in a solution containing one pint of formalin to thirty gallons of water. Formalin is a clear volatile liquid with an irritating odour. It does not possess any violent poisonous properties which are harmful to those handling it, beyond the fact that the fumes given off have a particularly irritating effect on the eyes and nose. In concentrated form, it must, therefore, be handled with caution. It is very poisonous to

plant life, and on this account is made great use of as a fungicide. It is sold by all chemists at about 3s. a pint.

If a large consignment of potatoes is being dealt with, it is best to immerse the potatoes as they are, together with their sacks or cases, in a large tank containing the liquid. They can then be taken out, and after being stacked up to drain, are ready for planting out immediately. Land which has once produced a scabby crop will retain the germs of the disease for several years, and consequently should not be planted with potatoes or any other root crop, such as beet, turnips, or carrots, for some time.

Growers should avoid as far as possible planting scab-infected tubers, as it must be evident that the variety used is one susceptible to the disease, and it may frequently happen that the disinfection of the tubers may not be as thorough as it should.

Leaf Blight of the Pear and Quince.

(*Entomosporium maculatum* Lév.)

By ETHEL M. DOIDGE, M.A., Assistant Plant Pathologist.

THE disease known as leaf blight or scald is one which is very prevalent in South Africa and a number of inquiries have recently been received with regard to the disease and its treatment. It has been reported as causing considerable damage to young pear trees, but it is especially prevalent on quince trees, which it attacks so frequently that one rarely sees a quince hedge which is entirely free from the disease. Trees which are badly infected are readily distinguished by their defoliated appearance and by the numerous dark blotches on the leaves and fruit.

In addition to the pear and quince, "leaf blight" is capable of attacking apple, peach, cherry, and other rosaceous trees. In Europe the disease has been known for nearly a century and has been reported from Germany, Sweden, Italy, and France. It is widely distributed in America, and the attention of horticulturists has long been directed towards it owing to its ravages among their seedling pear trees. Some years back leaf blight was mentioned as causing considerable damage to pear trees in Natal, so that the distribution of the disease and its host plants is almost identical.

Leaf blight is due to a minute fungous parasite known as *Entomosporium maculatum* Lév. The first indication of the presence of this organism is the development of small red spots on the upper surface of the leaf. These soon penetrate to the lower surface, the spot becomes larger, and the colour changes from red to a dark brown. In the centre of the diseased area one or more minute dark spots appear, slightly raised above the surface of the leaf. In these dark spots large numbers of spores are produced, which are set free and carry the infection elsewhere, each spore being capable of infecting a healthy leaf. The diseased areas are often very numerous, and when this is the case the whole leaf becomes discoloured and falls to the ground. Young leaves shrivel up, but older leaves, owing to the rigidity of their tissues, retain their shape and only become brown.

As a rule all the leaves on a tree are attacked, so that defoliation, more or less complete, often results. Not infrequently a second growth of leaves is produced and these suffer in the same way. This repeated defoliation much weakens the trees and interferes seriously with the growth of the wood and the maturing of the fruit; in the case of nursery stock the trees are often killed outright, or are so enfeebled that grafting becomes a difficult matter. The ravages of the disease are not confined to the leaves, but also extend to the branches and the fruit. Reddish, almost circular, spots appear on the young shoots; these become elongated,

slightly sunken with a slight central elevation, and black in colour. These diseased areas spread and coalesce, forming irregular patches which encircle the branch and cause the death of the portion above the diseased area. The fruit also shows the carmine-red spots which afterwards become dark coloured; the skin becomes much roughened and often cracks, so that even if the fruit does mature properly its appearance is spoiled and the cracking makes it liable to decay.

Leaf blight can be completely held in check by spraying. The trees should be thoroughly sprayed, before the buds begin to swell, with bordeaux mixture. For this first application a strong solution is recommended. It should be made in the following proportions:—

Copper sulphate	5 lb.
Quicklime	5 lb.
Water	45 gals.

When the leaves are about two-thirds grown a second application should be made, this time using a more dilute solution, made up according to the formula:—

Copper sulphate	4 lb.
Quicklime	4 lb.
Water	100 gals.

To prepare bordeaux mixture, crush the copper sulphate and dissolve it in water. In another vessel slake the quicklime and add to it several gallons of water. Strain the milk of lime into the copper sulphate solution and add enough water to make the mixture up to the full quantity. The mixture can be used as soon as it is cool.

It would be well, especially in the case of nursery stock, to repeat the application of the weaker solution every three or four weeks throughout the summer.

Diseased leaves should be raked together and burnt, and should not be allowed to lie on the ground under the trees. It is also advisable to remove badly diseased branches, as an epidemic in spring may originate from the mycelium of the parasite remaining in the branches through the winter.

Peach Freckle or Black Spot.

(*Cladosporium carpophilum*, Thüm.)

By I. B. POLE EVANS, M.A., B.Sc., F.L.S.

FRUIT GROWERS in this country are frequently troubled with an unusual spotting and discolouring of their peaches and nectarines. Peaches in particular are so checked in growth that they fail to ripen normally, and eventually suffer much cracking. (See Plate.)

This condition of affairs is brought about by the action of a fungous parasite, which causes the disease commonly known as freckle, black spot, or scab. The fungus was first described in 1877 by a German botanist, who found it causing considerable damage to peaches at Klosterneuburg, near Vienna, in Austria. Some twelve years later it was to be found in nearly all the peach-growing districts of the United States and California. To-day it is frequent on peaches throughout South Africa.

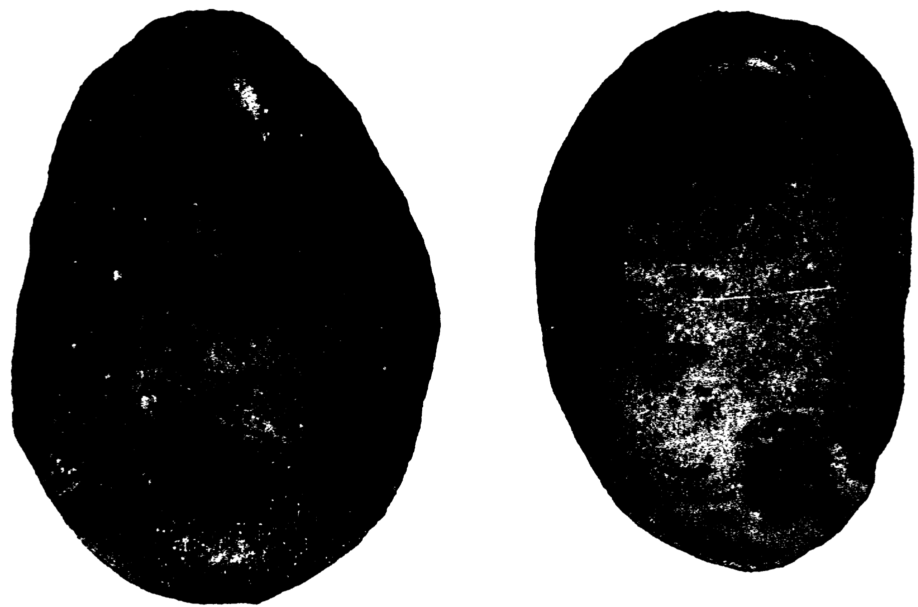
The disease may affect the apricot, almond, cherry, nectarine, peach, and plum. As it most commonly occurs on the peach in this country, its characteristic appearance on this fruit will only be given here.

It first appears in the form of small, round, and dark green spots, usually at the stalk end of the fruit. These spots quickly increase in numbers, and extend their range of growth towards the apical portion of the peach. They are nearly always much more abundant on one side of the fruit than the other, and the side most exposed to the sun is the worst affected as a rule. The spots usually coalesce and produce dark-coloured patches. The parts of the fruit attacked by the fungus become hardened and tough, and not infrequently the side affected shrivels considerably. If any further growth of the peach takes place after the skin has become hardened by the action of the fungus, a characteristic cracking of the fruit occurs which greatly impairs its keeping capabilities, in that it renders it an easy prey to decay fungi.

The most effective treatment for this spot disease is winter spraying. About three weeks before the buds begin to burst, the tree should be thoroughly sprayed with "bordeaux mixture". The best formula to adopt will be that recommended for peach leaf-curl, viz., 5 lb. copper sulphate, 5 lb. of lime, and 45 gallons of water.

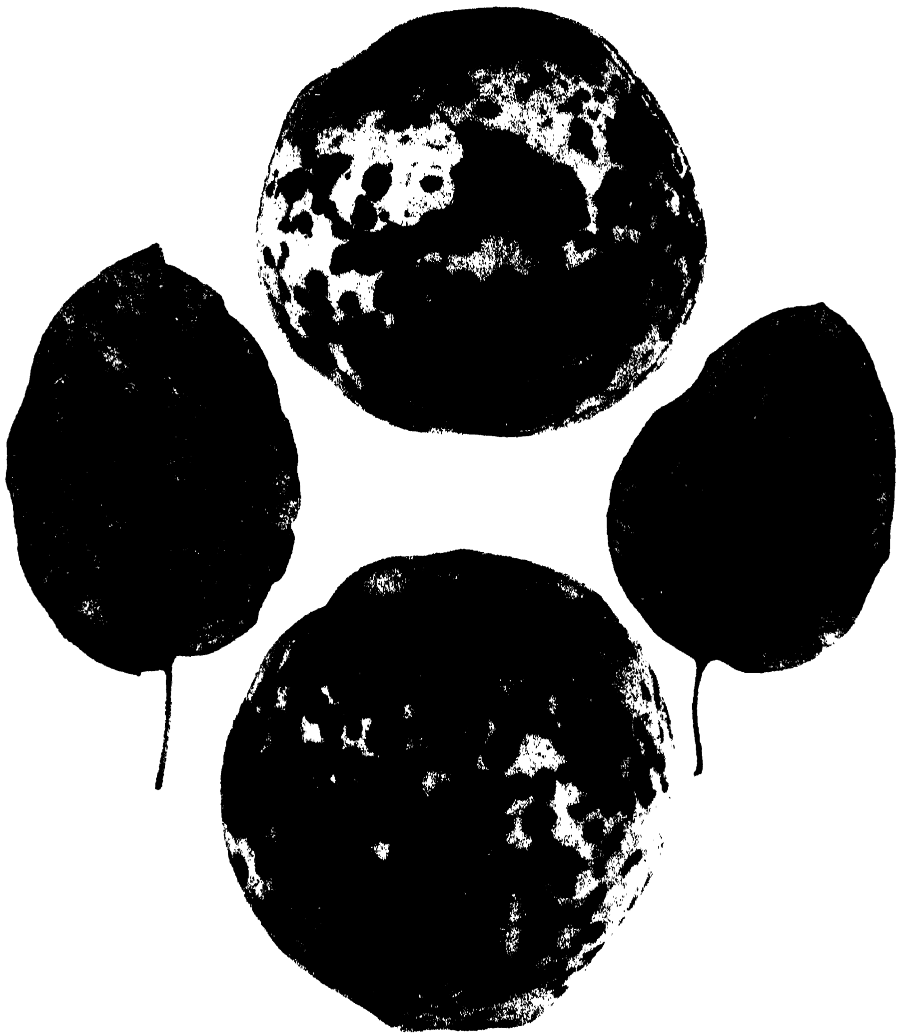
The mixture should be made up as follows:—Place the 5 lb. of copper sulphate, after crushing, in a 45 to 50 gallon cask and dissolve in 10 gallons of water. Then, in another cask, slake 5 lb. quicklime, which should be of the best quality, and add 10 to 12 gallons of water. Strain the milk of lime into the copper solution, stir well, and add sufficient water to make up 45 gallons. When cool, the mixture is ready for use. Two more sprayings will probably be found necessary to give the best results. These should be carried out just after the fruit has set, and again when it is about half-grown.

The "bordeaux mixture" formula for these two latter sprayings should be 4 lb. copper sulphate, 4 lb. lime, and 100 gallons water, otherwise the foliage is likely to suffer injury from the spray used.



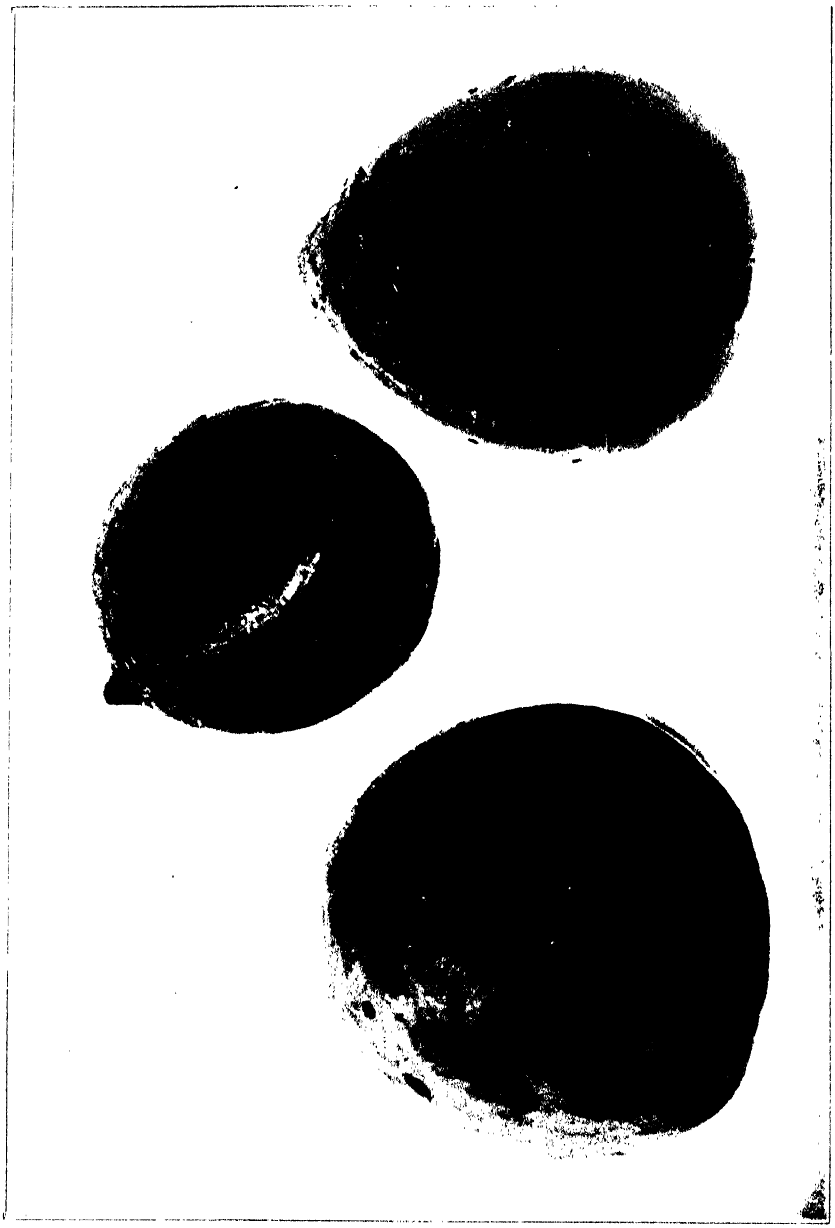
Scab on Potatoes.

(*Oospora scabies*, Thaxter.)



Leaves and Fruit of Quince affected with Blight Disease
(*Entomosporium maculatum* Lév.)

Maize Smut or "Brand'



Peach Freckle or Black Spot.

(*Cladosporium carpophilum*, Thüm.)

Maize Smut or "Brand".

Sorosporium reilianum (*Kühn*) McAlp.

By I. B. POLE EVANS, M.A., B.Sc., F.L.S., Plant Pathologist.

SMUT or " brand " in the maize crop is a phenomenon so familiar to almost every farmer throughout South Africa that some growers look upon it as part and parcel of the plant, and do not realize that it is a disease caused through the agency of a foreign organism. The organism is a microscopic plant known as a fungus. A knowledge of its life-history, its mode of existence, and its relation to its host will be found useful to those who wish to keep it under control. This microscopic plant lives as a parasite within the tissues of the maize, and is only seen by the ordinary observer when it breaks out on the surface of the invaded parts as a black, dusty mass. The black powder or smut consists of myriads of microscopic reproductive bodies, commonly known as spores. They serve to propagate the fungus and disseminate the disease, and correspond in function to seeds in the higher plants. Each spore is brown and spherical, and measures about one thirty-three hundredths of an inch in diameter. Under favourable conditions these spores germinate, and give rise to a number of secondary bodies which are blown about by the wind, and then infect the maize plant. (See Plate.)

It is found that the spores germinate more readily, and also give rise to a larger number of secondary bodies, in fresh stable manure than in ordinary soil. Consequently, if a heavy dressing of fresh stable manure is applied to land infested with smut spores just before planting, the risk of infection will be much greater to plants growing in such ground, inasmuch as more secondary bodies will be produced than would have occurred in untreated land.

As the secondary spores are able to infect all young and tender parts of the maize plant, their presence in the maize lands should be prevented as far as possible. This can best be done by removing and burning all smutted plants by using seed free from smut spores and by avoiding the use of fresh stable manure at the time of sowing.

Ammoniacal Solution of Copper Carbonate.

By ETHEL M. DOIDGE, M.A., Assistant Plant Pathologist.

IN efficiency as a fungicide this solution ranks high, in this respect being only surpassed by bordeaux mixture. The cost per gallon is a little higher than for the latter, but it has some decided advantages over it.

The ammoniacal solution of copper carbonate is a clear solution entirely free from sediment; it is therefore easily applied, and does not clog the nozzle of the spray pump. It is not so liable to injure the foliage of the plants to which it is applied, and can, therefore, be used quite freely on maturing fruit and also upon flowering plants without fear of causing stains.

When certain plants require spraying with a fungicide shortly before the crop is harvested, this preparation is an excellent one to use. It is especially recommended for treating various plants affected with mildew, and can be used generally for spraying purposes where a good quality of quicklime is not obtainable for making up bordeaux mixture.

The following is the formula for the solution:—

Copper carbonate, 5 oz.
Ammonia (sp. gr. .880), 1 quart (2 lb.).
Water, 40 gallons.

Dilute the ammonia with about two gallons of water; dissolve the copper carbonate in the diluted ammonia, stirring until completely dissolved, then add the remaining 38 gallons of water.

TO PREPARE COPPER CARBONATE.

As commercial copper carbonate is difficult to obtain in this country, and the chemically pure compound sold by chemists costs 2s. 6d. per lb. it is more economical for spraying purposes to prepare copper carbonate from copper sulphate (bluestone) and sodium carbonate (washing soda); in this way a good quality of copper carbonate can be obtained at a cost of 1s. 6d. to 1s. 8d per lb.

Place in a barrel 25 lb. of copper sulphate, and dissolve in hot water; in another barrel dissolve 30 lb. of washing soda. Allow both solutions to cool, then slowly pour the soda solution into the copper sulphate solution, stirring it while doing so. Fill the barrel with water, and allow the precipitate of copper carbonate to settle. Upon the following day siphon off the clear supernatant fluid, which contains most of the sodium sulphate in solution. Fill the barrel again with water, and stir the precipitate vigorously into suspension; again allow the precipitate to settle, and again on the following day siphon off the clear fluid. This operation washes the carbonate free of most of the sodium sulphate which contaminates it.

Make a filter by tacking stout muslin to a square wooden frame which will just fit over the open top of the second barrel, letting the

muslin hang down loosely so as to form a sack. Through this filter the precipitate so as to drain off the excess of water, and then allow it to dry in the air. It is then ready for use. Copper carbonate prepared in this way, in addition to being considerably cheaper, has the advantage of being almost entirely free from chemical impurities.

RECAPITULATION OF METHOD.

First Day.

1. Dissolve 25 lb. of copper sulphate in hot water.
2. Dissolve 30 lb. of sodium carbonate in hot water.
3. Allow both solutions to cool.
4. Slowly pour soda solution into copper sulphate solution, stirring all the time.
5. Fill the barrel with water.

Second Day.

1. Siphon off the clear supernatant fluid.
2. Fill the barrel with water and stir vigorously.

Third Day.

1. Again siphon off clear liquid.
2. Filter residue through muslin.
3. Dry.

The above quantities yield a little over 12 lb. of copper carbonate, which is sufficient to prepare 1600 gallons of the ammoniacal solution for spraying. The cost varies from 16s. to 20s., according as the price of copper sulphate varies from 4d. to 6d. per lb.

The Preparation of Bordeaux Mixture.

By ETHEL M. DOIDGE, M.A., Assistant Plant Pathologist.

BORDEAUX MIXTURE is universally admitted to be the best fungicide for general use. It approximates more closely than any other mixture known to the ideal liquid for spraying, which should be effective as a fungicide without harming the foliage of the plants sprayed, and should be moderate or even cheap in cost.

Many fruit-growers and farmers make the mistake of waiting until disease actually appears among their trees and field crops before spraying. Systematic spraying with bordeaux mixture should constitute part of the routine of every well-regulated orchard and vineyard; and it should be used as a preventive measure to protect the foliage from the attacks of fungi while it is tender and most liable to become diseased. Fruit trees should be sprayed twice in winter, the second time just when the buds begin to swell. The formula generally used for the winter spray is:—

Copper sulphate, 5 lb.
Quicklime, 5 lb.
Water, 45 gallons.

After the foliage has expanded, the trees should be sprayed a third time, but with a more dilute solution.

For general use the following formula is recommended:—

Copper sulphate, 4 lb.
Quicklime, 4 lb.
Water, 50 gallons.

For some trees with tender foliage, especially peach trees, which are very susceptible to injury, this solution is too strong. For most other trees also, before the leaves are mature, this mixture should be diluted by half. The formula then reads:—

Copper sulphate, 4 lb.
Quicklime, 4 lb.
Water, 100 gallons.

Three sprayings should be sufficient to prevent the outbreak of any epidemic in the spring, when the trees are most liable to attack; but should any disease appear later in the season further sprayings will, of course, be necessary. The small outlay necessary for spraying in the winter and early spring will be abundantly repaid by the heavier crop of fruit which will result, and by the increase of market value due to the absence of spotting, cracking, and other indications of disease. A good quality of quicklime can be obtained at the rate of 4s. 6d. per 100 lb., and copper sulphate at 4d. per lb. Thus the cost of making up 100 gallons of bordeaux mixture according to the standard (4-4-50) formula does not exceed 3s. 6d.

It is important that a good quality of copper sulphate and quicklime should be obtained, and on no account should air-slaked lime

be used, as bordeaux mixture made with air-slaked lime has proved very injurious to foliage.

The method by which the mixture is made is also of the utmost importance. Experience has shown that the best results are obtained by a mixture made up according to the following directions:—

Stock solutions of copper sulphate and lime should be prepared in advance, and should always be kept on hand. To prepare stock solutions proceed as follows:—

Fill a barrel or some other suitable vessel with 25 gallons of water. Weigh out 25 lb. of copper sulphate and tie it up in a piece of gunny sack; then suspend the sack containing the copper sulphate just beneath the surface of the water by tying it to a stick lying across the top of the barrel. If the copper sulphate is suspended in this way it dissolves much more rapidly and completely than if it is simply thrown to the bottom of the barrel.

A shallow vessel is preferable to a barrel when large quantities of lime are to be slaked at once; great care should be taken in slaking the lime. Weigh out 25 lb. of quicklime and add water gradually until a smooth paste is obtained. There are two common faults—the first is the addition of too little water, which results in too much heat, and the "burning" of the lime. In this case there are many small lumps which do not completely slake, and which will be thrown down when the limewater is strained. The second fault is the addition of too much water, resulting in "drowning" the lime, and consequently in incomplete slaking. The water should be added in small amounts to keep the action steady, and should be constantly watched during slaking. When the lime is thoroughly slaked, add enough water to make up the amount to 25 gallons, and strain the whole into the barrel in which it is intended to keep the stock solution.

The solutions thus prepared are now of a definite strength, 1 lb. to the gallon.

When the stock solutions have been made up it is a comparatively simple matter to prepare the mixture for spraying. To make up 50 gallons according to the 4-4-50 formula, for example, proceed as follows:—

In one barrel place 4 gallons of the stock solution of copper sulphate, then add 21 gallons of water. The first lot should be carefully measured and the height at which it stands in the tub marked, so that in making succeeding mixtures it is only necessary to fill up to the mark.

Thoroughly stir the stock solution of milk of lime and transfer 4 gallons to a second barrel, and fill up with 21 gallons of water as for the copper sulphate solution. The two solutions thus diluted should be slowly poured together into a 50-gallon barrel, or, if more convenient, the copper sulphate solution can be poured slowly into the limewater, but *not* the reverse process.

If this method is followed exactly, i.e. if the stock solutions are diluted fully and equally before mixing, the resulting mixture settles less rapidly than when made by other methods, is less frequently injurious, and attains a maximum of adhesiveness.

It is advisable, however, to test the mixture before use, to determine whether it will be safe to apply it to tender foliage. To accomplish this two simple tests may be made. First, insert the blade of a penknife into the mixture, allowing it to remain for at least one

minute. If the polished surface assumes the colour of copper-plate, the mixture is unsafe, and more limewater must be added. If, on the other hand, the blade of the knife remains unchanged, it is safe to conclude that the mixture is as perfect as it can be made. As an additional test, however, some of the mixture may be poured into an old plate or saucer, and while held between the eye and the light the breath should be gently blown upon the liquid for at least half a minute. If the mixture is properly made, a thin pellicle, looking like oil on water, will begin to form on the surface of the liquid.

When using the mixture for leathery leaves or any others to which the mixture does not seem to adhere, the addition of soft soap or treacle in quantity equal to that of the copper sulphate will increase the adhesiveness of the mixture.

Injury to the foliage of trees following the use of bordeaux mixture is to a large extent preventable. The principal sources of injury are:—

1. Use of impure or improper materials.
2. Carelessness in making the mixture.
3. Improper and ineffective application.

1. A good quality of copper sulphate should be obtained, and on no account should air-slaked lime be used.

2. Materials should be weighed out carefully, and the quantities should not be guessed at. Nor should the mixture be made up in what appears to be the easiest way rather than by the method detailed above, which has been demonstrated to be the best way.

3. Much material is wasted through improper and ineffective application; the work should not be entrusted to a native unless he is under constant supervision.

If due precautions are taken injury to the foliage will be reduced to a minimum. It should be noted, however, that leaves which have been attacked by insects or fungi are much more liable to injury from bordeaux mixture than perfectly healthy leaves. This is another reason why spraying should not be delayed until the disease actually appears, but should, in preference, be used as a preventive measure.

Grape Thinning at Worthing.

BY G. B. MCMILLAN, Horticultural Assistant, Elsenburg College.

NOTE.—This report is simply an account of the thinning process as carried out on hothouse grape culture in England. It is not put forward as a practice to be adopted in its entirety by the growers of table grapes for export to England in the Cape Province, as there are a number of important reasons why this is impossible. It may contain ideas that will lead to the discovery of a thinning process suited to the conditions under which the grape export industry in the Cape Province exists. Growers are invited to communicate with the Department of Agriculture on this subject. Address correspondence: "Horticultural Assistant, Elsenburg Agricultural College, Mulder's Vlei, Cape Province."

Varieties Grown.—Gros Coleman, White Muscat of Alexandria, Alicante, Muscat Hambro, Cannon Hall Muscat.

Object of Thinning.—The object of thinning is to secure grapes of large and uniform size, and to a certain extent to regulate the weight of the crop. This latter object, viz., the regulation of the weight of the crop, is not "thinning" in the strict sense of the word.

The operation of thinning consists in the removal of such berries as cannot develop to a large size even under the best condition, and in leaving on each bunch a number of berries sufficient to fully occupy the available space on the bunch, and yet not numerous enough to crowd one another. A bunch of grapes is properly thinned when at maturity the berries just touch but do not crowd one another.

The stage at which to thin.—This fact is determined by the following considerations, viz.:—(1) The variety; (2) the condition of the crop for the particular season; (3) the skill of the labour employed for the work.

With regard to these considerations the following explanations are necessary:—

I.—Since some varieties (e.g. the Alicante) have naturally a larger number of berries for the same amount of space than others (e.g. the Muscat of Alexandria), the thinning can be done most efficiently and economically at a different stage in each case for the following reason.

In a bunch which has very many berries, the stage at which the berries begin to get crowded (thereby rendering the work of thinning difficult and slow) arrives sooner than in a variety where the bunch is naturally a loose one. Thinning should be done when there is still sufficient space to make the operation easy, and hence the proper stage (from this point of view) varies with the variety.

II.—With regard to the second consideration, i.e. the condition of the crop for the particular season, the following explanation is made. Since every variety is itself liable to vary with respect to the thickness of the setting of the berries on account of external conditions, the best stage for thinning each variety will vary from year to year. This consideration is not of great importance, because variation in the thickness of the setting of the berries occurs only within narrow limits, and happens only occasionally.

III.—With regard to the third consideration, viz., the skill of the labour employed, the following may be said. Some skilled thinners are able to discern, even in the early stages of growth, which berries are incapable of development to full size, and also to judge of the proper number of berries to remove to secure a well-filled bunch while the crop is still very young. In such cases it is possible to do the thinning at an earlier stage than is possible with the ordinary labour.

In general the stage at which thinning should be done can be stated thus. Thin when the berries are about ¼ in. in diameter or as large as a medium-sized pea, for at this stage it is possible to discover (by their smaller size and different shape) which berries are incapable of full development, and also to judge easily of the proper number to leave to secure a well-filled but not crowded bunch.

This general rule will be modified by the three considerations outlined above.

The amount to thin.—This is determined by (*a*) the variety; (*b*) the condition of growth for the particular season; (*c*) the size of the crop.

(*a*) The variety determines the amount of thinning to be done, because the berries of certain varieties can be made to develop to a larger size (above normal) than those of other varieties. The berries of the Gros Coleman grape can be stimulated to a greater development by severe thinning, whereas no amount of thinning will make the berries of the Muscat Hambro increase more than slightly above normal. The number of berries to be left is determined by the variety also because certain varieties set more berries than others, e.g. the Alicante sets more berries than the Cannon Hall Muscat.

(*b*) The condition of the vines' growth for the particular season influences the amount of thinning to be done because the quality and growth of the berry depend on the vigour of vine which varies somewhat in hot-house culture and still more in open culture. When the growth is vigorous, a larger proportion of berries should be removed than when the season is unfavourable.

(*c*) The size of the crop affects this determination because a light crop means much vigour and therefore requires heavy thinning, whereas a heavy crop means that the individual bunches are incapable of very great development since the vigour of the vine has to be so widely distributed, and therefore with a heavy crop the thinning should be light. In case of a light crop, however, care must be taken not to diminish the total weight of the crop by very severe thinning.

Under average conditions the proportion of berries to remove varies from one-third in the Muscat to two-thirds in the Gros Coleman.

With new varieties investigation alone can show what amount of thinning is necessary..

The operation of Thinning.—The necessary appliances are

(1) A pair of straight scissors, finely pointed, and about 5 in. long.

(2) A thin stick about 6 in. long, forked at one end.

By supporting the bunch with the fork of the stick by pressing it against the central stem the majority of the stoneless berries can be shaken off.

The bunch can be manipulated by means of this forked stick, making it possible to cut out unnecessary berries without handling the bunch.

Good berries on the upper part of the bunch should be left, or the lateral stems will be exposed to view, and this is undesirable.

Cost.—At 3s. per day of eight hours the cost is about 1d. to 1½d. per lb. of mature grapes. The cost varies greatly.

Notes on Some Wild Pasture Plants.

By JOSEPH BURTT-DAVY, F.L.S., Government Agrostologist (Transvaal).

Panicum brizanthum, Hochst.—This grass is a native of the Transvaal bushveld. Captain W. H. F. Hughes, of Zeerust, writes that it grows well on the poorest sandy ground and that cattle are very fond of it. The only previous record we have of its value as a pasture grass is a note from a farmer near Salisbury, Rhodesia, stating that it is eaten by cattle there. We have no record of any vernacular name by which this grass is known.

Eragrostis namaquensis.—This grass is a native of Natal, the Free State, and parts of the Cape Province. It has not been recorded as occurring in the Transvaal until this year. We are in receipt of specimens from Mr. F. J. Wepener, of Johannesburg, who reports that it grows in his garden in the Pretoria District, a few miles north of Johannesburg, and that last winter it kept quite green while the other veld grasses were dry. He adds: "The cattle seem very fond of it." *Eragrostis namaquensis* is an annual grass, and is therefore not likely to replace tall fescue, burnet, and paspalum for late autumn and winter feed.

Sporobolus indicus.—This grass is spreading along roadsides in the Transvaal and Natal, and is known as Os-grass and 'MCheegi. It is a hard grass, sometimes considered useless, but I notice that cattle are quite fond of it while it is green, and will graze it close when other feed is dry. It should not be confused with the other Os-grass (*Bromus Willdenowii*).

Gomphrena globosa ("Bachelor's buttons").—This tropical weed is causing some alarm among farmers because it is spreading over the country with such rapidity. We find that the ostriches at Skinner's Court eat it readily. Mules, donkeys, and cattle also eat it with avidity. This weed is sometimes called "Khaki-weed", but it should not be confused with the true Khaki-weed or Khaki-dubbeltje, *Alternanthera echinata*.

Physalis minima (Wild Cape gooseberry).—This tropical annual weed is spreading rapidly in cultivated lands. Ostriches eat it readily, and one of our correspondents reports having turned his ostriches into his maize lands to clean them of Pig-weed (*Amarantus paniculatus*), *Physalis minima* and other weeds, leaving the ostriches there until they began to strip the young maize plants; this resulted in a saving of at least one weeding of the maize crop.

Bidens pilosa.—It is not generally known that the common Black Jacks, Beggar-ticks, or Wewenaar is a highly nutritious fodder plant which may be cut for hay or put into the silo with maize stalks.

Dairy Records.

THE following are the milk records of the dairy herds at the Elsenburg Agricultural College, Cape Province (for April), and the Experimental Farms at Tweespruit and Grootvlei (for March and April):—

ELSENBURG COLLEGE (APRIL).

Breed and Name of Cow.	Days in Milk.	Yield in Lb. During April.	Yield in Lb. Total to Date.	Yield in Lb. Daily Average.
FRIESLANDS.				
Cleopatra	361	82	8131	22·5
Romula	328	149	5182	15·8
Vera	272	80	6054	22·2
Belladonna	234	8	5656	24·1
Rose	226	498	6783	30·0
Bell	155	493	4307	27·7
Veronica	132	412	2966	22·4
Boerin	105	366	1679	16·0
Cato	64	276	747	11·6
Victoria	36	961	1155	32·0
Anna	22	351	351	16·0
Christina 58	22	526	526	23·9
JERSEYS.				
Grace	335	11	5377	16·0
Gus...	302	62	5062	16·7
Fanny	263	28	4500	17·1
Evelyn	242	226	3087	12·7
Glee	225	300	4713	21·3
Gwendolen	15	307	307	20·4
Gertie	15	361	361	24·0
AYRSHIRE.				
Queen Dot...	248	214	4568	18·4
SHORTHORN.				
Helen	209	65	2283	10·9
CROSS.				
Disa	317	381	7692	24·2

The following are the average percentages of butter fat of the different breeds of cattle at Elsenburg:—

Friesland ... ... = 3·07 per cent.
Jerseys ... ... = 4·97 „
Ayrshires ... ... = 4·00 „

TWEESPRUIT EXPERIMENTAL FARM (MARCH).

Breed and Name of Cow.	Date of Last Calving.	Lb. Milk.	Fat Test.
Frieslands.	1910.		
Rinske III.	16th September	888	4·0
Nora	20th October	998	3·2
Japke	1st June	658	3·7
Gertje	23rd November	779	3·7
Dijkstra	18th November	705	3·1
Trijntje	13th December	810	3·0
	1911.		
Anna II.	10th January	844	3·2
Red Lincolns.	1910.		
Daphne	22nd December	686	3·8
Clusia	26th August	358	3·7
Bracebridge	10th October	454	3·9

GROOTVLEI EXPERIMENTAL FARM (MARCH).

Breed and Name of Cow.	Date of Last Calving.	Lb. Milk.	Fat Test.
South Devons.	1910.		
Primrose	13th October	595	3·3
Opal	10th November	479	4·0
Merry Glass	19th November	635	4·0
	1911.		
Bertha	31st January	762	3·4

N.B.—The above-mentioned cows are not forced by heavy feeding for milk production. The yield of milk shows what each cow is capable of doing under satisfactory conditions for a breeding herd.

TWEESPRUIT EXPERIMENTAL FARM (APRIL).

Breed and Name of Cow.	Date of Last Calving.	Lb. Milk.	Fat Test.
Frieslands.	1910.		
Rinske III.	16th September	590	4·2
Nora	20th October	654	3·0
Gertje	13th November	657	3·7
Japke	1st June	545	3·7
Dijkstra	18th November	600	3·1
Trijntje	13th December	669	3·0
	1911.		
Anna	11th January	681	3·0
Veeman	11th April	907	3·2
Red Lincolns.	1910.		
Daphne	22nd December	566	3·8
Clusia	26th August	322	4·1
Bracebridge	10th October	386	4·1

GROOTVLEI EXPERIMENTAL FARM (APRIL).

Breed and Name of Cow.	Date of Last Calving.	Lb. Milk.	Fat Test.
South Devons.	1910.		
Primrose	13th October	485	4·0
Opal	10th November	361	5·1
Merry Glass	19th November	493	4·4
	1911.		
Bertha	31st January	624	3·3
Sweetheart	18th March	652	3·9

ELSENBURG COLLEGE HERD.

Subjoined is the milk record to the 31st May, 1911 :-

Breed and Cow.	Days in Milk.	Yield in Lb. During May.	Yield in Lb. Total to Date.	Yield in Lb. Daily Average.
FRIESLANDS.				
Rose	257	546	7329	28·5
Bell	186	503	4810	25·8
Veronica	163	472	3438	21·0
Boerin	136	264	1943	14·2
Cato	95	247	994	10·4
Victoria	67	890	2045	30·5
Anna	53	384	735	13·8
Christina 58	53	535	1061	20·0
Daisy	15	559	559	37·2
Violet	4	157	157	39·2
Beauty	2	67	67	33·5
Vera	2	71	71	35·5
JERSEYS.				
Evelyn	273	214	3301	12·0
Glee	256	277	4990	19·4
Gwendolen	46	656	963	20·9
Gertie	46	845	1206	26·2
Grace	29	679	679	23·4
Gus...	21	358	358	17·0
Gladys	20	465	465	23·2
AYRSHIRES.				
Queen Dot...	266	67	4635	17·4
Lobelia	31	884	884	28·5
CROSS.				
Disa	348	366	8058	23·1

Average percentages of butter fat :—

Frieslands	3·26	per cent.
Jerseys...	4·55	,,
Ayrshires	3·95	,,

Western Province Agricultural Society.

THIRD EGG-LAYING COMPETITION.

(Commenced 1st May, 1910; finished 30th April, 1911.) (Four Birds to a Pen.)

Record for APRIL, 1911, and Totals to end of Twelve Months.

Pen Number.	Owner.	Breed.	Record for Month. Eggs.	Weight. oz.	Weight. dwts.	Total for Twelve Months. Eggs.	Weight. oz.	Weight. dwts.	Position.
1	W. P. Cowan....	White Leghorns (Eng.).......	32	66	5	526	1009	10	4th
2	B. Kauffmann...	Brown Leghorns.............	36	70	0	500	932	7	6th
3	K. B. Jobling....	White Wyandottes...........	20	40	8	381	742	12	16th
4	R. G. Hudson...	Brown Leghorns (1 dead).....	22	45	0	305	613	11	30th
5	K. B. Jobling....	White Leghorns (Aust.-Amer.).	21	45	4	437	863	0	9th
6	S. A. West.......	White Leghorns (Amer.)......	17	38	7	403	822	11	10th
7	A. F. Rackstraw.	White Wyandottes...........	24	53	7	212	444	7	45th
8	J. W. Wright....	White Wyandottes...........	35	67	1	318	602	5	32nd
9	R. W. Hazell....	Columbian (1 dead)...........	14	31	13	168	341	7	49th
10	S. A. West.......	White Leghorns (Amer.)......	—		—	351	706	7	21st
11	C. H. v. Breda...	White Leghorns (Amer.)......	10	21	14	293	609	14	31st
12	S. C. Skaife......	White Wyandottes...........	52	97	8	410	735	12	18th
13	R. W. Hazell....	White Orpingtons............	12	27	2	240	503	11	42nd
14	Clif. Hoole......	Buff Leghorns................	7	13	3	323	619	8	28th
15	F. T. Hobbs.....	Silver Wyandottes...........	30	52	11	301	553	13	36th
16	B. Kauffmann...	Black Minorcas (1 dead)......	6	13	12	180	400	8	48th
17	S. C. Boyes......	White Leghorns (Amer.)......	13	26	13	516	1024	1	2nd
18	A. Aitken.......	White Leghorns (Amer.)......	3	6	9	528	1013	10	3rd
19	F. Muller.......	Black Minorcas..............	—		—	164	338	0	50th
20	B. Kauffmann...	Brown Leghorns.............	8	14	8	347	632	3	25th
21	R. W. Hazell....	White Wyandottes (1 dead)...	35	72	1	261	526	15	39th
22	J. P Seabrook...	Blue Andalusians............	12	26	8	381	781	1	14th
23	S. A. West.......	Red Sussex..................	40	76	0	310	589	10	34th
24	R. W. Hazell....	White Wyandottes...........	20	41	10	366	733	3	19th
25	J. Leibbrandt...	White Wyandottes...........	5	9	12	284	563	14	35th
26	R. G. Hudson...	Black Wyandottes...........	35	70	1	374	714	7	20th
27	H. H. Bright....	White Leghorns (Eng.).......	15	33	1	321	642	1	24th
28	O. C. Macpherson	White Leghorns (Amer.)......	13	26	14	325	649	7	22nd
29	H. H. Bright....	Black Leghorns (1 dead)......	9	17	12	298	550	9	37th
30	H. H Bright....	White Leghorns (Eng.).......	3	6	9	257	518	2	40th
31	C. H. v. Breda...	White Leghorns (Amer.)......	—		—	437	819	3	11th
32	S. Smith.........	Brown Leghorns (3 dead).....	3	6	6	317	593	6	33rd
33	F. T. Hobbs.....	Silver Wyandottes...........	1	2	1	161	303	4	51st
34	A. Keppie.......	White Wyandottes...........	46	85	15	423	776	5	15th
35	C. H. v. Breda...	White Leghorns (Aust.).......	35	69	3	646	1169	3	1st
36	S. Smith.........	White Leghorns (Danish-Am.).	—		—	427	805	4	12th
37	F. T. Hobbs.....	Silver Wyandottes...........	18	33	12	276	500	6	43rd
38	Vacant..........	—	—		—	—	—		—
39	C. H. v. Breda...	White Leghorns (Aust.-Amer.).	9	18	13	544	1007	3	5th
40	R. J. Williams...	Black Minorcas (2 dead)......	—		—	92	219	9	52nd
41	F. Muller.......	Black Minorcas (1 dead)......	11	21	0	251	512	7	41st
42	C. H. v. Breda...	White Leghorns (Amer.)......	5	11	3	297	647	14	23rd
44	C. H. v. Breda...	White Leghorns (Amer.-Aust.) (1 dead)	16	35	3	464	905	14	8th
45	B. Kauffmann...	White Leghorns (Eng.)........	17	34	4	312	616	3	29th
46	S. A. West......	Brown Leghorns........... ..	3	6	11	322	630	7	26th
47	R. W. Hazell....	Black Orpingtons............	—		—	227	443	7	46th
48	C. W. Pilkington.	Rhode Island Reds...........	8	19	6	239	527	15	38th
49	S. Smith........	Brown Leghorns (2 dead).....	4	9	12	219	406	2	47th
50	C. H. v. Breda...	White Leghorns (Aust.-Amer.) (1 dead)	21	39	11	512	915	2	7th
51	K. B. Jobling....	White Leghorns (Aust.-Amer.) (1 dead)	14	27	0	315	619	14	27th
52	S. A. West......	Brown Leghorns (1 dead).....	—		—	253	493	5	44th
53	N. Cole.........	Brown Leghorns.............	28	56	8	406	801	13	13th
54	K. B. Jobling....	White Leghorns (Amer.) (1 dead)	22	45	11	372	735	14	17th

Western Province Agricultural Society.

FOURTH EGG-LAYING COMPETITION.

16th May, 1911, to 15th May, 1912.

Record for Period from 16TH MAY, and Totals to end of MAY, 1911.

Pen Number.	Owner.	Breed. (Six Birds to a Pen.)	Record for Month. Eggs.	Record for Month. Weight. oz. dwts.	Total to Date. Eggs.	Total to Date. Weight. oz. dwts.	Position to Date.
1	F. W. Nicholson..	Buff Orpingtons............	—	—	—	—	—
2	F. T. Hobbs	Silver Wyandottes..........	9	15 13	—	—	14th
3	A. Riley.........	Black Minorcas (R.C.)........	13	21 4	—	—	9th
4	N. Cole	White Leghorns (Amer.)	1	1 14	—	—	19th
5	S. T. Jones	White Leghorns (Amer.)	10	20 0	—	—	12th
6	H. Curtis........	White Leghorns (Amer.)	20	36 13	—	—	6th
7	S. C. Skaife......	White Wyandottes...........	—	—	—	—	—
8	A. Keppie.......	White Wyandottes...........	12	20 15	—	—	10th
9	S. A. West.......	White Leghorns (Amer.-Danish)	—	—	—	—	—
10	H. H. Bright.....	Black Leghorns	—	—	—	—	—
11	B. Kauffmann ...	Brown Leghorns	11	23 1	—	—	8th
12	B. Kauffmann ...	Black Leghorns	14	26 13	—	—	7th
13	C. W. Pilkington .	Rhode Island Reds	8	18 14	—	—	13th
14	W. P. Cowan	White Leghorns (Eng.)........	7	11 6		—	16th
15	A. J. Stacy......	White Leghorns (Aust.-Amer.) (Re-entered from last competition for second year test.)	9	20 13	—	—	11th
16	B. Kauffmann ...	White Leghorns (Eng.-Amer.)..	43	85 6	—	—	1st
17	S. Smith	Brown Leghorns	6	10 9	—	—	17th
18	Mrs. H. H. Bright	White Leghorns (Aust.)	—	—	—	—	—
19	N. Cole	Brown Leghorns	19	40 0	—	—	5th
20	F. Molteno	White Leghorns (Amer.)	2	3 8	—	—	18th
21	C. H. van Breda..	White Leghorns (Aust.)	35	63 7	—	—	3rd
22	Mrs. C. H. van Breda	White Leghorns (Amer.).......	23	42 5	—	—	4th
23	S. A. West.......	Brown Leghorns	6	11 10	—	—	15th
24	Graham, Hope & Co.	White Wyandottes	—	—	—	—	—
25	R. V. R. Jones ...	White Leghorns (Amer.-Aust.) .	—	—	—	—	—
26	S. Smith	White Leghorns (Dan. & Amer.)	41	75 6	—	—	2nd

MANAGER'S REPORT.

In this, the fourth laying competition, the birds for the first few days after their arrival experienced several changes of weather. The 15th was very hot and oppressive; the 16th, gusts of warm wind and a windy night; the 17th, a warm, very boisterous wind most of the day, but from 4 p.m. to 6 p.m. it suddenly became quite cold; 18th, a blustering wind with only one hour of sunshine: 19th, no sunshine, very heavy rain, and cold. These changes in the weather, added to their change of quarters, had a detrimental effect on the egg yield, but I am glad to report that it has now increased and the birds have settled down well. Taking them on the whole, they are a very good lot, and several pens are exceedingly well selected. Some birds, especially of the heavy breeds, were rather fat; this has been brought down to normal by extra litter, this giving them more exercise to find their grain. The birds in several pens are unfortunately not fully matured, which may handicap their chances, although they are coming on well, and will probably lay large eggs, thus making up for lost time. It is always wise to aim to have all the pullets matured and laying by 1st May and hatch accordingly, bringing them on naturally without a check. The cockerels and pullets should be separated at as early an age as possible. This tends to quicken the growth and increase the vigour of both sexes and brings the pullets into lay earlier. Fifty-one birds are laying, the majority well, a few intermittently, and a few have just commenced, and I have pleasure in reporting a yield for the 16 days of a total of 289 eggs, weighing 549 oz. 13 dwts.

All the birds are laying in pen No. 16; five in pens Nos. 11, 21, and 26; four in pens Nos. 6 and 19; three in pens Nos. 3, 12, 14, and 22; two in pens Nos. 2 and 23; one in pens Nos. 4, 5, 8, 13, 15, 17, and 20.

The size of the eggs is good (there has been only one below 1½ oz., many being 2 oz. and well over). Double-yolked eggs have been laid by No. 65, one weighing 2 oz. 12 dwts.; No. 96, two, 3 oz. and 3 oz. 6 dwts. Soft-shelled eggs have been laid by Nos. 91 and 16, one each.

Health.—The health of the birds is good, with the exception of one which developed inflammation of the eye and parts around, the day after arrival, but has improved under treatment (the cure of this ailment is usually rather slow and a tedious one). One bird was found to be losing weight and is being treated accordingly. Nos. 75, 77, and 78 are recovering from their moult, and Nos. 66, 109, and 142 are moulting: evidently the two first had been laying for a little time; the change stopped them and threw them into moult; measures are being taken to get all through as quickly as possible.

The Weather.—This has been very changeable, especially the first week, as noted above, but from the 21st to the 24th, inclusive, the days were bright (averaging 7½ hours' sunshine a day), and conducive to good health and laying. Since then, with the exception of the 28th and 31st, it has been windy, and wet, and dull, and the nights cold; but we must expect this now, and take precautions accordingly, as are being done, to guard against cold, and also increase the egg yield.

ARTHUR LITTLE.

Transvaal Maize Crop.

THE Agricultural Statistician for the Transvaal furnishes the following report on the condition of the present maize crop of the Transvaal Province, as it stood towards the end of April, 1911 :—

District.	*Actual Yield,* 1910. *In bags.*	*Estimated Yield,* 1911. *In bags.*
Barberton	15,593	13,400
Bethal	205,828	150,000
Bloemhof	27,418	8,250
Carolina	20,269	15,700
Ermelo	120,422	120,000
Heidelberg	294,905	240,000
Krugersdorp	33,059	26,560
Lichtenburg	212,483	110,000
Lydenburg	43,568	35,000
Marico	21,901	15,000
Middelburg	156,568	150,000
Piet Retief	31,396	20,500
Potchefstroom	347,849	295,000
Pretoria	102,911	82,000
Rustenburg	46,226	38,000
Standerton	174,852	185,000
Wakkerstroom	36,766	35,000
Waterberg	64,375	49,500
Witwatersrand	71,508	50,000
Wolmaransstad	50,775	38,000
Zoutpansberg	100,342	80,700
Total for whites	2,179,104	1,750,610
Total for natives	1,176,091	644,350
Grand Total	3,355,105	2,394,960

On account of the frost being later than usual, there is a slight increase in the estimated data of the returns received.

The estimated returns received from the Native and Sub-Native Commissioners show a decrease of native crops from 850,000 bags, as published by us in March, to 644,350 bags.

It would appear that 960,145 bags less will be reaped than last year.

We must again remind that during the year 1910 this province exported 759,000 bags, and for January–March, 1911, 147,107 bags have been exported.

Nothing more can be added to the report which appeared in the *Union Gazette* of 24th March last.

This must be taken as our final report of the estimated mealie crop of this season; as soon as possible the actual yield will be published.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

JUDGING SHEEP BY POINTS.

To the EDITOR of the *Agricultural Journal.*

SIR,—A demand frequently arises that Merino sheep should be judged by points at shows. As I have tried it and realized that it is impracticable, I think it would be in the interests of all concerned if you would publish "Camden's" letter, "Judging by Points", which appears in the April issue of the *Pastoralists' Review*. "Camden" is an acknowledged authority on Merino sheep, and sums the matter up most concisely. I admit that a scale of points is workable for passing sheep into a stud book, but not in a large class of sheep. Of course, if the first and second sheep run each other very close, and have to be brought together, it ends in their being judged by points, even though the points be not recorded. But the demand is that a scale of points should be attached to pens for the information of disappointed exhibitors and the public.—Yours, etc.

Ripplemead, Dohne, C.P. R. PELL EDMONDS.

"Camden's" letter in the *Pastoralists' Review* reads as under:—

"I was very interested to read 'Merin's' letter in the last issue and am glad he supports my idea of classifying Merino sheep at shows on the rainfall basis. I cannot, however, follow him in his proposal to judge by points, because I do not see how it is to be done. If there were only two sheep competing in a class it might be possible to say that one is so many points better than the other, but if there are several competitors I do not see how the point awards are to be made with equity. How can a judge handling, say, twenty exhibits in a short space of time say that each sheep is worth so many points? Take the matter of fleece alone. A judge may give one ram five points, another nine points, another six points, but can he be really sure that they are each worth the points he awards? Has he any basis to go on? He gives one ram five points for fleece, then goes on to the others. He may give the first one six points, the next nine, the next seven, the next four, and the next five. Can he be quite sure that the two rams he gave five points to are just worth five points—no less and no more. Perhaps if he brought the two five-point sheep together he would find occasion to again alter the respective value of their fleeces. And as regards constitution, it is the same. I could easily say that one ram should lose two points for constitution, but I could not say why he should not lose four points or even five. And so with all the other important features to be considered in judging.

"No! There can be no rule of thumb in judging. That instinct which makes a man a successful breeder of live stock makes him a successful judge. Sight and touch do the thing in the twinkling of an eye, and a scale of points would be found unworkable by a practical man."

SWISS MILCH GOATS IN SOUTH AFRICA.

To the EDITOR of the *Agricultural Journal.*

SIR,—Adverting to your article on the above subject in the May issue of the *Journal*, I wish to state that at Graaff-Reinet hundreds of children are being fed on goats milk. Last year, when I visited the place, I made inquiries and the people did not seem to know what Malta Fever was. There are a good many people in Graaff-Reinet who use goats milk and did for many years past. When there I acquired a cross Swiss she goat, who gave birth to twins, and for some time gave us seven bottles of milk per diem. We are using the milk in our tea and coffee and with porridge, not boiled, and so far with no ill results.

By boiling the milk, the danger is naturally neutralized.

Several of these Swiss goats yield as much as ten bottles of milk per day; a great deal depends on the feeding.

A good Swiss milch goat in the yard is a good asset, I can assure you, and costs very little to feed.—Yours, etc.,

Pretoria. GID. F. JOUBERT.

To the EDITOR of the *Agricultural Journal.*

SIR,—The article on Swiss goats appearing in the May issue of the *Journal* has proved very interesting to me. I have had Swiss goats off and on for some time. I remember well those imported by Mr. Ko ischel, and also those by Mr. Rubidge. So far as I can ascertain there are very few, with the exception of Mr. Rubidge, who have bred these goats. The others who had some have all disposed of them or given up breeding. Mr. Rubidge's figures are low for importation. We imported some from the best stock, and they cost us landed £13 15s. each. The goats all went up north, and it was not a paying speculation to us. Since then I have had some fine animals, and am now breeding same. I sold one ewe now giving six bottles per day. She is milked three times daily. Those handled by me are all Saanen bred, and from what I see of them fill all our wants. They are a purely milking type and, like all good milkers, want careful handling to get the best results. Stall-fed ewes give best results. Those imported are fed with warm bran, soft feeds, etc. By breeding from pure stock, one does not get a good strong goat; my method is to take a selected Boer goat ewe of best milking strain and build up, and the result is satisfactory. I have some half-bred, three-quarter bred, and pure now, all bred this way. These are doing excellently on poor veld, whereas had they been bred from pure stock (imported), they would all have been dead—and the Colonial way of working with such stock soon lays them out. The Saanen is a hornless goat, white in colour, but in crossing with Boer goats the colour depends upon the selection. The demand from East Coast fever areas for milch goats is great, and if good stock is available, a ready sale is now made. Mr. Harry Barker had a nice selected stock bred in the same way as my goats were, but he too sold out to individual buyers for their own use, so it now leaves Mr. Rubidge and myself, as far as I know, with these goats. All I can say is, they are excellent milking machines, they want good handling like all good dairy stock, but are poor mutton-makers. It is a class or branch of farming that wants fostering. I should be glad to answer any queries about same. The Government would do a good action in importing some good rams and ewes for the farmer, and I would be prepared to take some.—Yours, etc.,

Belgravia, Cradock, C.P. GEO. H. BYRNES.

ECONOMICS OF ORNITHOLOGY.

To the EDITOR of the *Agricultural Journal.*

SIR,—Mr. H. W. James, of Venture, Hales Owen, Cape Province, has recently written to me stating that in April, 1910, a large number of red-billed weavers (Quelea) built their nests and reared their young in a cluster of trees on "Hales Owen"; he describes the sight of the nests and birds as one never to be forgotten, every tree in the cluster, which covered a space of 200 yards by 50 yards, having thirty or forty nests in it and each of these contained three or four pale blue eggs. The most interesting feature of the occurrence is that these birds were unknown in that locality before, and after rearing their young, left the neighbourhood and have not since returned.

This discovery is interesting, as disproving the theory that these birds are parasitic in their nesting habits.

I may mention that I made inquiries and searched personally for fifteen years for authentic nests and eggs of this bird, without success. Rough nests were sometimes found, but they never contained eggs, and were such as are made for amusement only. As it was difficult to account for the presence of the birds during times when other weavers were breeding and still not able to find the eggs, I was led to the conclusion that they must be parasitic; this opinion was supported by my proving that another finch (*Vidua serena*) has this peculiar habit. My brother, two years ago, thought that he had obtained proof of this theory, and wrote an article to the *Journal* of the South African Ornithological Union to that effect; but in view of the fact that they had at least an elementary knowledge of nest-building, and that they had been known to lay their eggs in nests constructed by themselves in captivity, I still had some doubts as to their parasitic habits. Hence my expression that it was supposed to lay in other birds' nests.

This discovery is of more interest to ornithology proper than to agriculture, but as it has an indirect bearing on the latter, I trust that you will give it publicity as a correction of the statement made in the April number of your *Journal.*—Yours, etc.,

Transvaal Museum, Pretoria. AUSTIN ROBERTS.

GAME PRESERVATION.

To the EDITOR of the *Agricultural Journal.*

SIR,—I have read with great interest the article on game preserving by Mr. H. N. Devitt, of Pretoria, with regard to which I should like to make a few remarks.

I quite agree with Mr. Devitt that if the Government would buy the skins of the destructive vermin, it would reduce the numbers of such vermin to a considerable extent. But what about the class of people that shoots game in the close season? There is quite a lot of that going on, and I should imagine that game is thus destroyed faster than the vermin. I should suggest that if a man be caught shooting or destroying game in the close season, he should pay a fine of not less than £50 for the first offence and £100 for the second offence. This class of man will go and shoot game on anybody's farm on the quiet. I should say if a man is caught shooting on another's farm without the consent of the owner, he should also pay a fine of not less than £50, and if he is caught shooting on another's farm in the close season he should pay a fine and go to prison for six months.

Then, I think, the game licence should be made £5 instead of 30s., but allow a man to shoot game on his own farm without a licence for his own use. The selling of game should be absolutely stopped, and if a man be found selling game he should pay a fine of £50. Although game-selling is stopped on the markets, people sell game on the quiet.

All these fines could go towards paying for the destruction of vermin. If this were carried out, I do not see why the game should not increase, but if there be not a better check on the people, I fear the paying for skins will not help much.—Yours, etc.,

" Honesty ", P.O. Fourteen Streams. N. S. MOORE.

To the EDITOR of the *Agricultural Journal.*

SIR,—In the May issue of the *Agricultural Journal* appears a letter from Mr. E. H. Rulman, referring to a contribution of Mr. Devitt's in your March issue as to destruction of game by the secretary bird.

When I was still in my early teens (and that is many years ago), I often, on my father's farm, saw secretary birds kill and eat sheep and goat lambs just born, also young game of all kinds, and the chicks of partridges and pheasants. I have also often seen the bird catch and kill snakes. On my shooting one of these birds one day because it killed a thoroughbred angora kid born that day, I was remonstrated with because it was said that it was probihited by law to kill such birds, as they kill snakes. I may say that everybody in the district believed that there was a law on the subject, and that the penalty was 100 rixdollars (£7. 10s.) for every bird killed. About thirty-five years ago, I was asked by the late Sir Thomas Upington if I knew of any such law. I said I did not; but being then occupied in the afternoons from 4.30 to 5.30 in going through the archives from the days of Van Riebeek, searching for old laws and proclamations to date, I made a special point to keep this subject in view, and I also searched the old records in the Supreme Court for decided cases on this and other subjects, but I found not the slightest trace of any law or prohibition against killing this kind of bird. That the bird kills snakes is true, but my experience is that it prefers young game, kids, and lambs to eating snakes.—Yours, etc.,

Capetown. AUSTRO-AFRICANO.

BIRD PROTECTION.—BEE PLANTS.

To the EDITOR of the *Agricultural Journal.*

SIR,—I was much interested in the article in your last *Journal* on game preservation. The author mentioned swifts among the birds that he recommended for protection. The large black and large brown swifts with white bellies live exclusively upon bees and flying ants. If Mr. Roberts wishes, I will send him dried mouths and throats of these birds lined with bee stings next spring, as they have migrated now. Can he tell me where these birds nest, as I have never seen them anywhere but on the wing?

Two good bee plants here are the tree oudehout and the wild coffee, both flowering in the spring. The latter is also good for sheep, and is drought-resistant; its roots going down over thirty feet. There are several varieties of this plant.—Yours, etc.,

Nottingham, Lady Frere. R. D. BRADFIELD.

COTTON CULTIVATION.

To the EDITOR of the *Agricultural Journal.*

SIR,—Messrs. G. J. Elphick & Co.'s letter in your issue of March, *re* Cotton, was very interesting, more especially as it gives some enlightenment on the actual working of this very backward infant amongst Colonial industries.

They take exception to the cost of picking as set down in your issue of February, viz. 10s. per 1000 lb., taken from an article by Mr. W. H. Scherffius. I, of course, do not know how this estimate was arrived at, but whether taken by the acre, or by the yield mentioned, this amount is very fair.

It has often been stated that labour of picking is a stumbling block to the cotton industry in this country, and that until a picking machine is invented, the outlook is practically hopeless. I see from two accounts in your *Journal*, that such an invention is now on the market, but I am very sceptical about its ever proving a success, even in a stunted crop. Women are the best for this work, as they are for picking tea, coffee, etc. One good woman, with a little practice, can keep six acres of cotton under control, unless the weather and plants are forcing—when she may require a little temporary assistance. Taking the picking season to last six months—which in this country is doubtful—the woman's wages at 10s. per month, and the crop at 1000 lb. seed cotton per acre, this would work out at 10s. as stated in the article referred to.

But what proved most interesting was that attention is being given to the seed crop. To show farmers the results that can be anticipated from the lint crop alone is not fair to the industry; and therefore it is necessary to provide an outlet for their seed. The seed should be worth 1d. per lb. as a fertilizer, if nothing else. But let us estimate it as oil and cake, taking the low basis of 1000 lb. seed cotton per acre:—

Expenditure—						
Cultivation, say	£2	0	0			
Ginning and baling 300 lb. lint	1	5	0			
Shipping, brokerage, etc.	2	10	0			
Milling 700 lb. seed	1	0	0			
				£6	15	0
Returns—						
300 lb. lint at, say, 8d.	£10	0	0			
Oil	1	15	0			
Oilcake	2	10	0			
				£14	5	0

thus showing a balance of £7. 10s. to the good.

Oilcake, besides being valuable as a feed, is under some circumstances perhaps, more valuable as a direct fertilizer, especially so for sugar cane.

I must not trespass further on your space, nor am I inclined to give away what it has taken twenty years experience to obtain, but the interest I have taken for some years past, in trying to further the advancement of this industry in this country, must be my excuse for encroaching on your indulgence.—Yours, etc.,

Upington, C.P. O. R. COLEY.

INTRODUCTION OF TEFF GRASS.

To the EDITOR of the *Agricultural Journal.*

SIR,—In the April number of the *Journal* I find an article on "Teff Grass", in which the writer says: "The honour of bringing this valuable grass to South Africa is due to Mr. Burtt-Davy, who after introducing it to California, brought a few pounds of seed with him to the Transvaal in 1903." It may not be generally known that seeds of this grass were introduced into Natal many years ago, as the following extracts from the Annual Reports of the Natal Botanic Gardens at Durban will show. The first is from the report for 1887, and is as follows:—"*Eragrostis abyssinica*, Teff. I received from the Director of Kew Gardens a small bag of seeds of this plant, which is used in Abyssinia for making bread. The seed is very small, and it appeared to me that it would scarcely find favour in Natal as a cereal, though possibly in some parts of the Colony it might be found useful as a fodder plant. I therefore, after having had the seed tested, and finding it quite good distributed it in small packets to persons willing to give it a trial, and hope in a future report to be able to record the results." This seed was divided amongst twenty applicants, seventeen of whom were in Natal, two in Zululand, and one in the Transvaal. In the Annual Report for 1888 it is stated: "Teff as a Cereal in Natal. This plant will, as I suspected, have no value; but very favourable reports have been received of it as a quick-growing fodder grass." In the following year this appears: "It was highly thought of as a quickly-growing grass, though as a cereal it proves, as I had suspected, to have no value in Natal. Whether or no the recipients of the seed have thought it of sufficient value to continue its cultivation, I have no information. De Schonburgk says that it stands drought well, and is 'a good grazing grass'".—Yours, etc.,

Durban. J. MEDLEY WOOD,
Director, Natal Botanical Gardens.

A PHENOMENAL HAILSTORM.

To the EDITOR of the *Agricultural Journal*.

SIR,—The days of miracles are apparently not yet over, and even in horticulture miracles are frequently possible. The case to which I am about to refer is, in my opinion, beyond explanation.

The account of the phenomenal hailstorm which struck Florida during the summer of this year must still be fresh in the memory of every one who read it in our daily papers. The storm was indeed a record one, lasting as it did for a solid hour without one minute's cessation. The only variation there was, was in the size of the hailstones which fell. The leafy village of Florida which was one hour before the storm the pride of its residents and the admiration of visitors, was one hour later the saddest, most weird, and heart-breaking spectacle I think I ever set eyes on. When I got inside my garden fence I did not know the place; my thoughts could be better imagined than described.

It reminded one of an incident of years ago. A transport rider was on his way to Barberton in the days when there were no trains. While going down the precipitous and rocky roads of the "Devil's Kantoor", it happened that the brake of the wagon failed, with the result that the wagon with its ten thousand pounds weight of a load was precipitated down a gorge 300 feet below. This man's feelings could also be better imagined than described when he looked down into the gorge with the whip in his hand, and expressed himself: "Lord, you have taken my wagon, my oxen, and my gear, which is all I possess; now you might as well take the whip", and with that he flung the whip down into the gorge also. But this is not my point.

The hail played havoc; the fruit trees especially were stripped of all their fruit, foliage and even bark.

The most remarkable feature of the whole affair is, as far as my garden is concerned, that the apple trees which were up till the time of the storm quite immune from the "woolly aphis" blight, are to-day smothered in it. Everywhere where the bark has been shattered the vermin are secreted, and the trees are now in a more disgusting state than even after the storm. On the other hand, I have some apple trees which were always subject to the pest; in fact, before the storm they were so bad that I was seriously thinking of pulling them up and destroying them. These trees were, like the others, terribly knocked about, but strange to say, are now practically immune from the blight to which they were subject for years.

This is where I consider the miracle comes in, and a solution of it is what I now desire from the Government experts in horticulture.

I shall be pleased to show any one around who would like to make an inspection of the trees referred to.—Yours, etc.,

P.O. Florida, Transvaal, DAN STEYN.
16th May, 1911.

FRUIT PASTE.

To the EDITOR of the *Agricultural Journal*.

SIR,—With reference to what has been written about fruit paste, I wish to inform you that it is not at all a new thing, as stated by Mr. F. D. Bailey. When I was a child my mother used to make a great deal of these fruit "tamaletjes". Even my grandmother used to tell us how her mother made it. They are generally made out of very ripe peaches, plums or apricots. The process is as follows:—Remove the skins, then knead or mash up with the hands or pass through a mincing machine, so as to convert the fruit into a paste, which will be thin and running. Take a smooth board, rub a little fat on it, to prevent the fruit from sticking when dry, and pour the contents over the board to the average thickness of about one-quarter or one-half inch. Put a little salt to it, and when sun dried, sprinkle a little sugar over it and roll up. Pack away and give this to the children to eat during the winter months, instead of—I nearly put my foot into it; and your children will not only enjoy it, but be so much healthier for it.—Yours, etc.,

Pretoria. GID. F. JOUBERT.

To the EDITOR of the *Agricultural Journal*.

SIR,—Under separate cover I am forwarding you a sample of what is known as smeer perzik (fruit paste). I presume this is the same as Mrs. Van den Bosch's preparation. If so, this is not a new thing, and I believe is known to every farmer in South Africa. It can be eaten either raw or boiled, as it is prepared from thoroughly ripe fruit. The process s very simple; all that is required to make it a success is cleanliness.

If a market can be found for this paste, I have no doubt that if known amongst the farming community, enough of the stuff can be produced for commercial purposes.

The preparation is as follows :—Take ripe fruit, mince, add a little sugar ; spread on flat boards (greased) to dry. The mincing can be done with any meat-mincing machine.—Yours, etc.,

Joubert's Gift, A. M. JOUBERT.
P.O. Donkerpoort Station, O.F.S.

SOYA HEALTH COFFEE.

To the EDITOR of the *Agricultural Journal.*

SIR,—A few weeks ago I met a farmer from the Free State in the train. We talked about Soya health coffee, and he told me that it was so good and nice. He promised to send me a few beans, which he did. My wife roasted and ground these, and made a coffee, which tasted somewhat like peas, but was, however, nice to drink. She then mixed one part of Soya coffee with one part of Java coffee, and I must say that to my taste that was a delicious cup of coffee.

I should like to introduce this bean to our farmers' wives ; they will find that their coffee account will be considerably reduced.

I understand it also pays to grow these beans for the market. A little seed to begin with can be had from Mr. Burtt-Davy, Botanist. He is also prepared to give any information thereanent.—Yours, etc.,

Pretoria. GID. F. JOUBERT.

RAT EXTERMINATION.—PUMPKIN PIPS AND ARSENIC.

To the EDITOR of the *Agricultural Journal.*

SIR,—I am in perfect agreement with Mr. Eagle that rats and mice can become a terrible scourge, not only in the warehouse and the field, but as he remarks, often as the carriers of loathsome and infectious diseases. Hence the war that is being constantly waged against them.

I have no doubt that the remedy he suggests is a very good one, so long as there is no other food to tempt. But rats, like human beings, are very fastidious at times, and when they have a choice of foods, go for what they like best. For instance, I had a rather extensive plantation situated in a rocky kloof which afforded rats protection, and almost as fast as I planted they destroyed. Like Mr. Eagle, I resorted to Cooper's Dip put on bread, mixed with boiled wheat, and in other forms. I also tried all the other known destroyers that I could think of, without making any appreciable headway. The work of destruction still went on, and I began to despair. As a last resource, knowing the preference they had for pumpkin pips above everything else, I tried these, steeped in a strong solution of arsenic, with the result that I made a clean sweep of them, and I had the satisfaction of seeing them dead or dying in scores all over the place. I subsequently visited a friend who had also put out a large number of trees on a stony kopje heavily covered with grass, but with one or two exceptions, only the small stumps were left, whereas after this clearance, mine grew to great perfection.—Yours, etc.,

Rondebosch, C.P. E. R. BRADFIELD.

POISON FOR JACKALS.

To the EDITOR of the *Agricultural Journal.*

SIR,—With reference to the spreading of poison for jackals, I can state that this is the best way to kill them. Take mice or small birds, and put in them as much of the red poison as a sixpence will carry, then put the bait on the ground.

These baits will remain effective for a period from eight to fifteen weeks.

The hairs or feathers do not take up the poison and, therefore, the jackals cannot smell the poison. An ordinary meat pill remains effective only for two days, after that time no jackals will touch it. I used mice for the last two months, and not one mouse or bird remains in the veld. The advantage with mice is that after three weeks, if they are not devoured, they decay totally, and the veld is free of poison.

Two months ago the jackals killed some sheep during daytime. My sheep were trekking from an outstation and in four nights fourteen goats were killed. Now during daytime no sheep are caught, but when the sheep trek, sometimes one is caught, sometimes none. I have placed about fifty mice and birds in the veld.

There are still some jackals here, but you must understand that there are five farms around mine on which nothing is done.—Yours, etc.,

Zwartkoppies, De Aar, C.P. A. DU PLESSIS.

A SELF-SUCKING COW.

To the EDITOR of the *Agricultural Journal.*

SIR,—Before Mr. Rawlinson shoots his cow, let him try smearing something nauseous on the teats. Peruvian bark (quinine) boiled in water and put on in the form of a thin paste would possibly be effective. It could be sponged off before milking.—Yours, etc.,

Grahamstown. P. TOWNSHEND.

BEE-KEEPERS' EXAMINATIONS.

To the EDITOR of the *Agricultural Journal.*

SIR,—Under the heading of "Bee-Keepers' Examinations", and signed by "Ichneumon", a letter appears in your issue for May, to which I feel bound to reply and enlighten your correspondent upon one or two points of interest.

In the first place, I would point out that I have repeatedly drawn attention to the fact that no bee-keepers' association exists in Capetown, and at the last Rosebank Show, at which I gave a lect re on bee-keeping, I especially mentioned this and offered to assist if others would guarantee some assistance. As no one offered, and the question was not taken up by more than two, we are still in the same position, viz. without an association. If "Ichneumon" would send me his name and the names of others willing to assist, I shall only be too glad to render all the help I can towards forming an association here.

The South African Bee-Keepers' Association, which is now affiliated to the British Bee-Keepers' Association, has a number of members in all parts of South Africa, and as a temporary measure in order to meet local requirements, I was appointed honorary secretary for the Western Province to deal with matters affecting this particular district. Should your correspondent desire any further information, I will furnish him with all particulars.

With regard to the Bee-Keepers' Examinations, the South African Bee-Keepers' Association held an examination during show week at Johannesburg in April last, at which ten candidates entered for the British Bee-Keepers' Association certificate; and in all probability similar examinations will be arranged by our Association to be held next February during the Rosebank show week, at which I hope your correspondent will figure as a candidate.

If other bee-keepers in this district will only come forward with some offer of assistance I feel certain that the time will not be far distant before Capetown will have its district association—a real live body worthy of the name.—Yours, etc.,

LOUIS L. W. HARDWICK,
Hon. Secretary, South African
Bee-Keepers' Association
Villa Molong, Belville, C.P. (Western Province).

CROTOLARIA AGAIN—CONFUSED ISSUES.

To the EDITOR of the *Agricultural Journal.*

SIR,—It is with great diffidence that I write to you on the subject of lamziekte and *Crotolaria burkeana*, but as lamziekte is so bad in this district that "small" men dare not keep a cow to supply milk for the house, I feel now that, like Balaam's ass, it is up to me to say something.

For here, as with Mr. Turpin, it is with the breeding cattle—especially just before or just after calving—that the disease is so deadly. Oxen do die, but not as a rule if they are often in the yoke. Muscular exertion, I have heard, results in the system benefiting phosphatically. Certainly our experience here is that giving the oxen no time to die is the best way of working off the disease. And some of the most successful cattle farmers on the Fish River always work their heifers. Of the men in this district who still try and farm cattle, some give bonemeal and some do not. Of those who do give it, some continue the practice because they believe in it, others because they like to feel that if they sink they will sink with colours flying.

But whether bonemeal be a prophylactic or merely a bit of veterinary etiquette where lamziekte is concerned, the disease as we know it is quite unlike the disease proved by Dr. Theiler to be due to eating *Crotolaria burkeana*. Some of the older farmers do indeed say they have seen one or two cases with the characteristically outspread and upturned hoof. But in the last few years I have seen one man lose sixty head within the year; another fifty, and yet another his whole herd of milch cows. I saw, too, many of the dead and dying, but I never saw one with anything abnormal in the hoof. Just here the disease takes two forms. The one is a long-drawn-out semi-paralysis in which the beast's appetite

remains good, and he lingers sometimes for weeks and may recover. This we term "proper lamziekte". The other is an acute form, they say, of the last, where the cow is milked as usual in the morning and is found dead in the afternoon. This we term *Mapunga* amongst ourselves, but *Pasteurella bovis* if there is an omniscient one about. But whether we pass *Mapunga* or insist on *Pasteurella*, the very names show that the Kaffir as well as the scientist knows that the ox died from a disease of the ox.

If our form of lamziekte be caused by a vegetable poison—and the sudden nature of one form calls for some such explanation—then, firstly, it is due to a much more virulent plant; and secondly, it is strange that all the breeding cattle should die whilst the working oxen grazing in the same camp should go free.

No, Sir! We grant that Dr. Theiler has proved that certain quantities of *Crotolaria burkeana* fed to cattle will cause a sort of bovine laminitis (though to a mere farmer it is a moot point whether almost equal quantities of wilted lucerne or rape would not cause a like disturbance in a beast's system). And we accept thankfully—knowing the savant's passion for scientific exactitude—the piece of self-denial on Dr. Theiler's part in that he did not demand a separate pen for this disease but let it go in—*more nostro*—under the stijfziekte section (surely a triumph in acclimatisation). But we must demur when he generalizes for the whole of South Africa from the results of a successful investigation of the causes of lamesickness as it exists in a local area. For in effect he says: "This disease is due to eating *Crotolaria*; I call it stijfziekte; what you other fellows call stijfziekte must also be due to this or a like vegetable poison." As we gain knowledge, no doubt some forms of lamesickness will be found due to poisonous herbage, but again others will probably vindicate the truth of the want of phosphates theory. The mistake we make, I feel sure, is throwing a little bone-dust down the beast's throat, instead of throwing a lot on the veld. About the most progressive farmer in this district maintains that a beast derives more benefit from chewing an old bone than he does from a bolas of bonemeal. The Imperial authorities would not fight so shy of South African oat-hay unless they had good grounds for their belief in the want of phosphates theory; and the fact that this theory had the support of Duncan Hutcheon carries conviction, as he was a public servant of the highest type. His work was of very great benefit to this country, and of very little to himself; and, moreover, he died in harness.—Yours, etc.,

Highlands P.O., Cape Province. HAROLD HIGNELL.

Dr. A. Theiler furnished the following memorandum in reference to the above letter:—

(1) Lamziekte and *Crotolaria burkeana* have not been associated; only stiffsickness in the Western and Eastern Transvaal, as described in the *Agricultural Journal*.

(2) The differences between stiffsickness as caused by *Crotolaria burkeana* and lamziekte were distinctly shown in note on Mr. Turpin's letter. Stiffsickness due to want of phosphates does not show the symptoms of a laminitis as described in my article: stiffsickness caused by want of phosphates is characterized by a more marked fragibility of the bones, swelling of the joints, loss of condition, and is particularly pronounced in cows at calving.

(3) Highlands is notorious for lamziekte pure and simple. It was here that Hutcheon carried out some of his earliest investigations into that disease. Lamziekte, however, is a distinct disease, and in no way connected with stiffsickness as described. In places where stiffsickness does not occur, lamziekte is frequently met with, but on some farms in the Transvaal both diseases are encountered on the same farm.

(4) As regards Mr. Hignell's remark that I consider that what others call stijfziekte must also be due to *Crotolaria* or a like vegetable poison: I consider nothing of the sort, because I have given pictures and a clear description of the disease in the *Agricultural Journal*, so that everybody should be able to recognize it. The description of stiffsickness given by Hutcheon corresponds with that given by me.

(5) The phosphate theory might hold for all other stiffsicknesses except the one I have described, in which an analysis of the bones has not shown any want of phosphates.

Generally speaking, once we know the cause of lamziekte (or gal-lam-ziekte, as it is called in the Western Transvaal), very likely many of the diseases which go under the name of gallsickness or stiffsickness, will find a further explanation, which we are unable to give at the present time.

OSTRICH FARMING IN THE TRANSVAAL.

To the EDITOR of the *Agricultural Journal*.

SIR,—Having read and heard a great deal of controversy concerning ostrich farming in the Transvaal Province, through the solicitations of friends and the welfare of the industry, I take the liberty of asking you to insert this letter in your *Journal*. I do not propose to treat the subject exhaustively, but a few notes on the matter may be conducive to the interests of those who intend starting ostrich farming in the Transvaal.

My opinion is that there are great possibilities in the Province to carry on that class of farming, to a successful end, and no doubt as lucrative and great an industry will be obtained in the Transvaal as that which the Cape Province has experienced.

The following are some of the most important subjects for the intending ostrich farmer to bear in mind. First to enquire through some expert if your farm and the climatic conditions are suitable for the birds, and the number it will carry thus ascertained. Then construct your camps according to your requirements, say breeding camps according to the number of breeders, one for plucking birds and the other for chicks, put up good substantial fences, say poles 10 yards apart, five or six wires, and well laced; this will save you a lot of worry and loss of time in future.

Next, the best birds suited to your means. My advice is to buy the best, even though the numbers may be small; this, as in all other farming operations, is the most important one; start with a good foundation; your method should be to improve, hence you will become important. When purchasing your stock, get the advice of an expert, who without doubt will send you to the best breeders, of the class of bird required. Like every good thing they must be paid for. After purchasing, you must be most careful in removing the birds. I suggest that you procure some experienced man to assist you in removing them, as birds that are unused to strange sights, especially dogs, etc., will often stampede, sometimes causing a serious loss. The best method of driving is to mount three or four men each with a stock whip and one on foot to lead them, with a small bag of mealies, dropping a few at intervals, at the same time calling them in ostrich language, which is known to the majority of the Cape farm boys.

In camping off breeding birds, it is advisable not to put more than two hens with one cock; in the case of young birds they should be put into camps not later than March; then the necessary feeding must commence. In this case they should start nesting about July, the incubating period being forty-two days.

While the chicks are hatching the parent birds should not be disturbed, but a careful watch must be kept on the nest in case any chicks roll out, they being helpless for the first two or three days, and would not be able to return and invariably perish. Let the chicks remain with the parents for six days, during that time they will receive a course of nature's treatment which means a great deal for their future life; after that time they can be taken away with safety. Then the judgment of the ostrich farmer must be brought into use, as all depends upon his care and treatment to the future good progress of the young birds. At the age of six months their feathers are ready to clip, to be followed by drawing the quills from two to three months later if the birds are in good condition. The two chief markets for your feathers are Grahamstown and Port Elizabeth. You will find reliable and expert agents in both places.—Yours, etc.,

Welverdiend Station, Klerkskraal. QUENTIN H. H. BLACKBURN.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*. In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

NODULES IN BOWELS OF SHEEP AND GOATS.—WIREWORMS.

"An Enemy of Scab" asks:—(1) What is the cause of numbers of small sores (small stones) in the bowels in sheep and goats, especially sheep, at certain times? (2) Why do wireworms only appear in the fourth stomach of the animal? (3) Why do goats become scabby as soon as they get wireworms?

The following reply by the Veterinary Division (Transvaal) was posted:—(1) These nodules are the larval form of a worm known to science as the *Oesophagostoma columbianum*, and are rather common in sheep and goats in South Africa. (2) Because that is their natural habitat, just as the stomach of the horse is the natural habitat of the bot. (3) It does not follow that goats become scabby when they get wireworms, but anything that weakens the animal's system and leads to debility favours the development of all skin parasites.

BLUE-GUM ROOTS.

Mr. A. M. Robertson, P.O. Box 5235, Johannesburg, writes:—I am forwarding to-day a parcel containing roots, and will be very glad if you will kindly inform me to what species of tree they belong. They were taken from a borehole at Rosebank. This borehole is 76 feet deep and is cased to a depth of 57 feet, the remainder being solid rock. The roots have come up from the bottom in almost a solid mass to within 42 feet of the surface, and prevent pumping operations. The top of the hole is covered by parts of an engine, and the only trees near are blue-gums and wattles, also a few fruit trees, all at a distance of about 20 feet from the top of the hole. This borehole does not belong to me, but I am very anxious to find out what the roots are, as I recently sunk one 146 feet near gums and wattles. If these roots are gums, what is the best way to deal with them, and to what distance will such trees throw their roots?

The following reply by the Government Agrostologist and Botanist was posted:—It is very difficult to distinguish between the roots of different sorts of trees, as they often closely resemble one another. I think it is safe to say that the roots you have sent are not those of the wattle (*Acacia*). I do not see anything about these roots, and as blue-gums grow in the vicinity of the bore, it is safe to assume that they are the cause of the trouble. Blue-gum trees will send their roots for a tremendous distance; in certain cities there are municipal regulations which forbid holders of stands or erven from allowing gum trees to grow anywhere within *sixty feet* of a municipal sewer, drain, or water-pipe. The only sound method of treatment I can recommend at present is to cut down the trees.

COW NEEDING TONIC.

Mr. F. King, P.O. Box 3843, Johannesburg, writes:—I have a cow that is giving me considerable anxiety. She is young and had her second calf last February. About a fortnight ago she refused to eat her bran and mealie meal, and, do what I like, I cannot induce her to touch it. All she will eat is what she can pick up on the veld. She chews her cud, her motions appear quite all right, and she is not losing condition, but she has dropped from 18 to 10 bottles of milk a day. Her coat is quite glossy, but her eyes appear a bit dull. I started giving her 1 oz. of bicarbonate of soda on Friday morning for indigestion, when I was told by a dairyman that she was suffering from the liver, and on Friday night I gave her 30 grains of calomel and Saturday morning 1 lb. of Epsom salts. As no improvement has taken place, I am now giving her 1 oz. of bicarbonate of soda night and morning. I have shown her to a few people who understand all about cows, but cannot solve the mystery. May I trouble you to inform me what you think is the matter with her and what medicine I ought to give her?

The Veterinary Division (Transvaal) replied by post as follows:—I fear you have been ill-advised in giving the cow such a lot of medicine. Probably what she wants is a tonic. I would, therefore, suggest that you get a chemist to make up 36 tonic powders, each containing nux vomica, bicarbonate of soda, and sulphate of iron, 1 drachm each, and powdered aniseed, 2 drachms. Give one of these powders every morning and evening in a little crushed mealies, bran, etc. If the cow will not take the powder in her food, make a little oatmeal, mealie meal, or linseed gruel; add one of the powders to a bottle of the gruel and administer as a drench.

QUILLING OF OSTRICHES.

Mr. W. A. Marais writes:—In your February issue I read an article on young ostriches, stating that they should be clipped at six months, and that the quills should be drawn two months afterwards. This I did when the birds were six months old. I have 20 ostriches and have only now commenced farming with them. At present I have no lucerne to feed them on. Do you think it will do them any harm if I were to leave them with the quills until August, when I shall have green forage and lucerne? On the 25th of April it was two months ago that I clipped the feathers."

The following reply by the Ostrich Expert was posted:—In leaving the quills of chicks in until August, you run a great risk of new feathers. The general custom is to quill about eight or nine months old. Personally I should advise quilling at once, otherwise you will have to leave it, as June and July are bad months to quill in; the weather being cold, causes many of the sockets to close.

STARTING OSTRICH FARMING.

Mr. A. N. Smit, Kalabasfontein, P.O. Bethal, Transvaal, writes:—You will oblige me by giving me information about ostriches. I should like to start ostrich farming, with a pair of good breeding birds, or otherwise as you might advise. Is it better to buy chickens? I do not want any that have been bred by an incubator. Could you give me the prices of the different kinds from one month to six months old, as also of a pair of good breeding birds not more than ten years old?

The following reply by the Ostrich Expert was posted:—There are two propositions in starting ostrich farming, namely, to buy a pair of good breeding birds, or six-month-old chicks, the progeny of good birds. There is more risk with a pair of birds than with chicks, as if either get killed you cannot go on; on the other hand, buying chicks, you cannot breed from them for three years at least, and in the meantime they are subject to disease and accidents. In buying chicks I should advise Mr. Smit not to place too much importance on how the chicks are hatched out, but to get a guarantee that they are the progeny of good feathered birds and procure sample feathers off the parent birds if possible, and in buying breeding birds make sure that they are three years old or over and procure sample feathers of the birds he is buying.

SUNFLOWER CULTURE.

In response to a request for information *re* cultivation of sunflowers, the following notes, taken from the *Cape Agricultural Journal*, were posted:—Sunflowers grow best on light, well-drained, well-tilled fertile soil. As a general rule, it has been found in the Colony that the soil and conditions suitable for growing mealie crops will also grow sunflowers. The preparation of the land for this plant and the subsequent cultivation is similar to that required for mealies. To obtain the best results, sunflowers should be planted in drills three feet apart, to admit of cultivation, and when the plants are about 8 to 10 inches high, they may be thinned out to a distance of 13–16–24 inches, according to the variety. Ten to fifteen pounds of seed per acre are required.

As this crop is sensitive to frost, it should not be sown until all danger of this sort is past. Seed sown about September or October has given the best results. The sowing season will, of course, vary according to the locality. The most suitable climate is one which is warm and sunny, and not subject to unseasonable frost. The sunflower takes from three to four months to mature according to the variety of climate and soil.

The heads should be harvested shortly before they are thoroughly ripe (when the seed is firm and set). The sunflowers may be cut with a sickle or bill-hook, such as is used for cutting prickly-pears or aloes. The heads should be well dried, before being stored, to prevent moulding. The seeds are thrashed with flails, so they may be easily removed from the heads by pressing the latter against a revolving wooden cylinder into which nails have been partly driven, the projecting heads serving the purpose of teeth on the cylinder of an ordinary thrashing machine.

The yield varies considerably according to the variety and the method of planting and cultivation. In America the yield is from 30 to 50 bushels, 900 to 1500 lb. per acre.

In the Colony, a yeild of 3250 lb. per acre has been obtained. The seed of the sunflower yields from 15 to 20 per cent. of oil. The oil is extracted by machinery similar to that employed for extracting linseed oil, and is used for illumination, for wool-dressing, in paints, and especially for soap-making. It is, however, not suited for lubricating purposes. The cold-pressed oil is of especially good quality, and used for a variety of culinary purposes. Sunflower oil is especially highly valued for food in Russia during the prolonged periods of religious fasts, when no animal fat is eaten. Sunflower seed and the residue, after extraction of the oil, may be used for feeding to cows, sheep, pigs, horses, poultry, and ostriches.

CHICKEN-POX.

Mr. E. Palmer, Henley-on-Klip Hotel, Henley-on-Klip, Transvaal, writes:—Several of my fowls have recently become affected with a sore on the top of the head, which attacks the eyes and causes blindness. Could you inform me of a cure? The fowls are not confined, having ten acres to run over, including ploughed lands. They have a large house to roost in which is limewashed and well ventilated, kept thoroughly clean, and sprinkled with Jeye's fluid three times a week.

The following reply by the Poultry Expert (Transvaal) was posted:—You do not give me much information, but from your description I think that your birds are suffering from chicken-pox. Bathe the head and neck of the affected birds with disinfectant such as Condy's fluid and at the same time give each bird one or two pills made of flowers of sulphur and lard. In mixing this use as much sulphur as the lard will take. The cure will take from seven to twenty-one days according to the severity of the attack.

Mrs. J. Norden, P.O. Lawley Station, asks for advice regarding a disease which has lately broken out amongst her fowls and turkeys, causing a good many deaths. She writes:—"The turkeys mope for a few days and do not touch their food; then they get lumps about the size of a pea on the head and round the beak, which has a hard crust on it, coming off easily when touched; others, again, are unable to walk. The chickens (about two weeks old) get a kind of sore in the mouth and in the eyes, causing the latter to close up completely. From one chicken's eye, on squeezing the sore, a spongy kind of pulp was removed; this was done three times, but reappeared the following day."

The following reply by the Poultry Expert (Transvaal) was posted:—From your description I think that your turkeys are suffering from chicken-pox, which is very prevalent at this time of the year even in the best kept yards. The best cure that I have found for this disease is to mix flowers of sulphur and lard, using as much sulphur as the lard will take; when this is well mixed into a stiff paste, make it into oblong pills about an inch in length; give each bird one or two pills every other day, and at the same time, while handling them, bathe the head and neck with a disinfectant such as a solution of Condy's fluid. The cure will take from seven to twenty-one days according to the severity of the attack. Your chickens with the sore eyes are evidently suffering from roupy colds; the first indication of this is usually shown by a watery appearance in the eye, frequently accompanied by a slight froth; if taken in early stages it is soon cured; but when allowed to develop into such an advanced form as you describe the cure is generally a long and tedious business. Isolate all affected birds at once and keep them in a warm dry place; bathe the eyes every day in warm water containing Condy's fluid, taking care to remove any matter or growth, then dry carefully and put a little boracic acid powder into the eye; every day give a teaspoonful of water containing six or eight drops of spirits of camphor, holding the bird's head well back so that some of the liquid runs into the slit in the roof of the bird's mouth. In the case of very young chickens it is perhaps better to kill them at once, as during the time they are ill they will lose a lot of growth and will never make up for the lost time.

FAILURE OF MARE TO FOAL.

Mr. C. N. Smit, Nooitgedacht, P.O. Palala, via Nylstroom, has a mare, four years old, which is running with a stallion, but does not foal. She foaled in October, 1909; and the stallion has been with her since then. Both animals are in good condition.

The Veterinary Division (Transvaal) posted the following reply:—I would suggest you separate the mare and stallion, then try her after a few days to see if she will take him. When she takes him, keep them separate, and try her again on the 9th, 18th, 27th, 35th, and 42nd day; if she takes him on any of these days, you must start again as from the 9th day. If she goes over the 42nd day without taking the horse, you may consider her "stinted" as we say, namely, in foal; although this may not always follow as an absolute rule. Failing with the above method, try another stallion, or recourse may be had to the inseminaton.

TROUBLE WITH SHEEP.

Mr. A. J. Debenham, P.O. Botha's Pass, via Ingogo, Natal, writes :—On slaughtering a sheep the other day, my attention was called to a swelling at the junction of the wind-pipe with the lungs, about the size of a pigeon's egg. On cutting this open, a thick yellow matter exuded. The sheep to all appearance was fat and perfectly healthy. As similar instances have occurred, I should be glad if you could give me any information in the matter, as to cause, prevention, etc. I should also be glad of information as to remedy for caseous nodules in the wall of the intestines. By some this is ascribed to dosing the sheep with Cooper's powder as a preventive of " geel ziekte ", but I doubt if the theory is correct.

Answer.—The following reply was posted by the Veterinary Division (Transvaal) :—I am not acquainted with any particular disease the chief post-mortem appearance of which is a swelling at the junction of the wind-pipe and lungs, which when cut into, exudes a thick yellow matter. Such a condition we would expect to find as a result of an injury or possibly of some form of parasitic infection. You indicate several cases have occurred, which would appear to point to some specific origin, but it is impossible to give a definite opinion on the point unless one had an opportunity of making several post-mortems and microscopical examinations of the matter from the swellings. The caseous nodules in the walls of the intestines of your sheep form rather a common trouble in sheep in certain parts of the Union They are caused by the larval stage of a worm known as the *Oesophagostoma columbianum*. As can be readily understood, treatment when once the nodules have formed in the intestines is very unsatisfactory. No medicinal remedy can be expected to attack the embryos in the caseous nodules; the utmost that can be expected is to attack the embryos in the caseous nodules as they enter the intestines and before they become encysted, and to do that effectively the remedy would require to be administered in the form of a lick *continuously*. A useful lick can be made with :—Flowers of sulphur, three parts , powdered slaked lime, three parts ; common salt, thirty parts ; to be carefully and thoroughly mixed. So far as possible, sheep should not be allowed to graze over vleis or low-lying, swampy land, as it is in such places that they pick up the embryos of the worm.

GERMINATING POWERS OF SEASON-OLD OATS.

Mr. J. W. Gray, Malvina, Elliot, C.P., asks whether seed oats kept over from last season will germinate better when sown than fresh seed, all conditions being equal.

Answer.—The Government Agriculturist (Cape) posted the following reply :—I at one time carried out some experiments with seed that was kept for one, two, three, and up to six seasons, with the result that there was very little difference in the germination, but that the older the seed became, the slower was the germination. This shows that the germinating power of the grains was weakening and would ultimately cease. In my opinion, there would be absolutely no difference in the germination of good seed whether of this season's crop or held over from last season. There are some seeds which are supposed to germinate better if kept over for a season, but in the majority of cases the reverse is the case. With cereals, however, one season makes no difference.

MANURES FOR ONIONS, ROSES, AND CARNATIONS.

Mr. A. H. Naude, P.O. Box 813, Johannesburg, asks for advice as to the best manures for (1) onions—soil (*a*) fairly loose clayey, (*b*) loose sandy ; (2) roses (soil as for onions) ; (3) carnations (soil as for onions). Soil (*a*) retains moisture for a long time, and may, during the rainy season, require manuring. I am dependent upon rains, unless hand-watering is resorted to.

Answer.—The following reply by the Acting Government Horticulturist (Transvaal) was posted :—(1) The best manure for onions in fairly loose clayey soil would be superphosphates ; for loose sandy soil, superphosphates and bone meal in equal quantities. (2) Kraal manure for roses. (3) Carnations, bone meal and potash. A good way to apply manure to roses is by a thick mulch on the top of the ground before the rains commence, digging this in at the end of the rainy season and mulching again.

BURYING SCIONS.

Mr. J. R. Will, Colesberg, C.P., writes :—Reference is made in the *Journal* for April in an article on budding fruit trees, to the burying of scions a foot deep in the ground. I presume that a portion of the scion would be exposed to the air above the surface of the ground. Can the buds that have been underground be used in budding, or is it better to use those that have been above the surface ?

Answer.—The following reply by the Acting Government Horticulturist was posted :—The budwood should be *buried* in moist (not wet) soil. All the buds can be used. They may also be heeled in, but will not keep dormant so long this way.

TROPICAL FRUITS.—CITRUS TREES.

Mr. W. B. Cumming asks:—(1) Can a good book on the cultivation of tropical and sub-tropical fruits be obtained in this country? (2) Can you give me the names of nurserymen in Natal? (3) How many degrees of frost will young citrus trees stand without injury? (4) What is the best time for budding citrus trees? (5) There is a fruit called marula by the natives, about the size of a peach. It looks like a mango, has a large hard seed, tough skin, and strong scent. Elands are very fond of it. Is it a wild mango?

Answer.—The Acting Government Horticulturist (Transvaal) replied as follows:—(1) No book to my knowledge has been published dealing with tropical fruit growing in this country. Articles have appeared from time to time in the journals of the different Colonies which would help a beginner. Climatic conditions are, however, so variable that treatment which in one district is successful is not invariably so in others. (2) Names of nurserymen in Natal: Messrs D. A. English, and G. H. Wilkinson & Co., both of Maritzburg. (3) Four degrees of frost. (4) September to March. (5) No; marola is not a wild mango.

"JOHNSON GRASS."

Mr. W. Gillespie, Rietpoort, Zandspruit, writes:—When staying at Avoca, near Durban, I noticed a grass growing among the young cane which the horses seemed to be very keen on getting hold of at any time when we halted during our riding through the fields. As you will see from the sample enclosed, it stands over 6 feet, and has a good seed head. I should be glad to know if you recognize this grass, and if you know its likes and dislikes in respect of soil, climate, etc.

Answer.—The following reply was posted by the Government Agrostologist and Botanist:—The grass is "Johnson grass" (*Sorghum halepense*). This is a most troublesome weed, matting the soil together with its deep-spreading roots so that it is very difficult to get rid of when once it is established. Under sub-tropical conditions and in rich soil, it makes a good growth; but it does not stand drought or frost. It is said to be liked by all kinds of stock, but owing to its dangerous character and the fact that it does not furnish much feed under high veld conditions, it is not worth growing. Moreover, it is a host of the maize stalk-borer.

CONVOLVULUS SP.

Mr. J. Cloete, Zaaifontein, P.O. Arundel, sends a specimen of "Baviaans Touw", and asks for advice as to the best means of eradication.

Answer.—The Government Agrostologist and Botanist has replied as follows:—The specimen is a species of *Convolvulus*. Thorough winter fallowing of the ground after autumn ploughing is about the only way of getting rid of this troublesome weed. During the winter the ground should be cultivated and harrowed frequently to bring the roots of the weed to the surface and expose them to the air. The dry, cold air of midwinter and the burning sun usually kill the roots, but it is best to gather them into heaps and burn them before the spring rains set in, for if there is any life left in the joints new plants will be formed and all the work must be done over again. As a rule this method of treatment, if faithfully and persistently followed up, results in the complete eradication of the pest by the end of the second winter.

PACKING STRAWBERRIES.

A. M., Christiana, Transvaal, asks for advice in regard to the packing of strawberries for transport a hundred miles or more.

Answer.—The Acting Government Horticulturist (Transvaal) replies:—The best way of packing strawberries is to obtain a supply of small wood punnets, ½ lb. or even less. Packed in crates these would travel quite the distance mentioned. They can be obtained from Messrs. Devine & Co., Upper Paarl, Cape Province, or from the Marain Mills, Ltd. Banhoek, Stellenbosch, Cape Province.

WHAT IS THE HEAVIEST PIG KILLED IN SOUTH AFRICA?

Mr. James P. Robinson, W.U.L.A., Ressano Garcia, asks if any pigs have been killed in South Africa weighing 800 lb. or over. As we have no information on the subject, we would be glad if any of our readers could furnish Mr. Robinson with the desired information.

Notes on the Weather of March, 1911.

CAPE PROVINCE.

By CHARLES M. STEWART, B.Sc., Secretary to the Meteorological Commission.

MEAN pressure considerably above the average; a mean temperature less than usual except in the West and South-west; precipitation considerably above the normal over the summer rainfall area, but deficient over the winter rainfall area; a moderate number of thunderstorms; persistent southerly (SE. to SW.) winds over the greater part of the country; a moderate percentage of cloud, with a slightly increased fog-frequency; a larger number of gales than usual, with a few hot winds and some slight frosts: such were the most noteworthy features of the weather of March, 1911.

Precipitation, on a mean of 333 stations, amounted during the month to 3·67 inches on nine days, being 0·98 inch or 36 per cent. above the normal. This amount is 1·75 inches

Division.	Mean Rainfall (1911).	Mean No. of Days.	Average Rainfall (1891–1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
	Inches.		Inches.		Inches.	Per cent.
Cape Peninsula ...	0·82	7	1·54	2	— 0·72	— 47
South-west	0·43	4	0·84	3	— 0·41	— 49
West Coast	0·27	2	0·46	2	— 0·19	— 41
South Coast	2·36	9	2·06	7	+ 0·30	+ 15
Southern Karoo ...	1·01	4	1·30	4	— 0·29	— 22
West Central Karoo	1·62	5	1·53	4	+ 0·09	+ 6
East Central Karoo	2·93	6	2·42	7	+ 0·51	+ 21
Northern Karoo ...	3·87	8	2·41	6	+ 1·46	+ 61
Northern Border ...	4·24	9	2·85	7	+ 1·39	+ 56
South-east	6·72	12	3·61	9	+ 3·11	+ 86
North-east	5·49	12	4·00	10	+ 1·49	+ 37
Kaffraria	6·36	13	4·02	10	+ 2·34	+ 58
Basutoland	6·83	13	4·75	12	+ 2·08	+ 44
Durban (Natal) ...			4·96			
Bechuanaland ...	4·16	10	4·78	9	— 0·62	— 13
Rhodesia	2·42	9	3·68	9	— 1·26	— 34
Orange Free State ...	5·25	11	3·50	8	+ 1·75	+ 50

more than or almost double the amount that fell during February last and is 1·05 inches above the mean for March, 1910. (If, however, the 151 stations in the Orange Free State be taken into consideration, the mean for this month is increased to 4·16 inches or 2·33 inches more than the mean for the preceding month.) The accompanying table shows that the sectional means over the winter rainfall area were below the average by 41 to 49 per cent., the deficit extending to the Southern Karoo, where there was a shortage amounting to 22 per cent., also to Bechuanaland and Rhodesia, where the means were 13 and 34 per cent. respectively less than usual. On the other hand an excess of precipitation prevailed over the major portion of the summer rainfall area, where the surplus varied from 6 per cent. over the West Central Karoo to 86 per cent. over the South-east. The actual sectional means ranged from 0·27 inch over the West Coast area to 6·83 inches over Basutoland. Compared with the previous month the divisional means were largely in excess of the amounts then recorded, being commonly two to three times more than during that period, except over the South-west, where there was a decrease of about one-third, and over Rhodesia, where this month's precipitation was only about two-fifths that for February last—whereas, in comparison with the corresponding month of last year, the sectional rainfall was less over the West and South and Rhodesia, but considerably more elsewhere. Grouping the stations according to the amounts recorded during the month, it is found that of 484 stations (including the 151 in the Orange Free State) only 6 had *nil* and 41 had 0·01–0·50 inch; of the rest, 31 had 0·51–1·00 inch; 32 had 1·01–2 inches; 56 had 2·01–3 inches; 66 had 3·01–4 inches; 74 had 4·01–5 inches; 62 had 5·01–6 inches; 59 had 6·01–7 inches; 28 had 7·01–8 inches; 23 had 8·01–9 inches; 5 had 9·01–10 inches; 8 had 10·01–12 inches; and 3 had over 12 inches, viz., Port Alfred, 12·17 inches; Forestbourne, 12·89 inches; and Evelyn Valley, 15·40 inches. From this it will be seen that only about 23 per cent. had less than 2 inches and these were situated

chiefly in the West and South: elsewhere the rains were satisfactory, enabling ploughing to be carried out, and fell in time to put the veld in good condition for winter. Analysing the maximum falls in 24 hours during the month, it is found that of 304 stations supplying the necessary details, 79 had 0·00–0·50 inch; 41 had 0·51–1 inch; 119 had 1·01–2 inches; 59 had 2·01–3 inches; and 6 had 3·01–4 inches, viz., Philipstown, 3·11 inches on 20th; Vosburg, 3·20 inches on 19th; Katberg and Glencairn, 3·25 inches each on 20th and 19th respectively; Tent Kop, 3·29 inches on 7th; and Drummond Park, 3·40 inches on 20th. The daily intensity was therefore nowhere exceptional, the rains being largely of a light soaking character with but little run-off, although rivers were flooded and rendered impassable for several days in some districts, while a fall of 2·97 inches at De Kruis (Murraysburg) on 27th caused considerable damage, washing away soil, fences, and walls round lands. The number of *thunderstorms* occurring during the month was considerably less than in February last and less than during March, 1910, 372 instances being reported on 28 days. They were most numerous on 6th, but less widespread on 1st, 4th, 12th, 13th, 29th and 31st, which were the other days of their greatest frequency. None were noted on 23rd to 25th. *Hail* was noted at eleven stations on nine days, principally 13th; the only damage reported was that at Edendale (Glen Grey) on 29th, when the stones, described as the size of hen's eggs, played havoc with crops and stock. No *snow* or *sleet* noted.

Temperature, Cloud, and Wind.—The mean temperature of all stations was 67°·1, or 4°·2 lower than the preceding month, but 0°·4 higher than in March, 1910. The mean maximum (77°·5) was 4°·7 colder than during February, but 1°·4 warmer than during the corresponding month of last year, while the mean minimum (56°·6) was 3°·9 and 0°·8 respectively lower than the corresponding values for the months already mentioned. The mean daily range was therefore 20°·9. Compared with the normals the monthly mean was 0°·8 lower than usual, two-thirds of the deficit being due to a decrease in the day temperatures. The mean daily range was 0°·6 less than usual. (Over the Orange Free State the mean monthly temperature was 63°·0, the mean maximum being 73°·7 and the mean minimum 52°·2.) At the individual stations the monthly temperature was mostly 1–2° above the average over the West and South-west; this excess, however, decreased to 0°·4 at Cape Agulhas, and was converted into a deficit of a few tenths of a degree along the South Coast and over the South-east, rising to 0°·9 at Port St. John's; inland, the deficit was commonly 2–3°, increasing to 3°·9 at Bloemfontein and 4°·8 at Hopefountain, Rhodesia. The day temperatures were mostly higher than usual over the West and South-west by 2–3°, but were less than 1° lower along the South Coast and as much as 3°·5 at Port St. John's; inland, away from the coast, the days were generally colder than usual by 2–4°, but 4°·7 cooler at Amalienstein and 6°·6 and 6°·7 colder at Hopefountain and Bloemfontein. The night temperatures were above the average in the West and South-west by 0·5–2°, but 1–2° colder along the South Coast and in the interior, but 3° lower than usual at Hopefountain. Over portions of the South-east, however, these temperatures were more than 1° higher than usual, and the deficit at Port St. John's was only 0°·4. The mean warmest station was Mochudi with a temperature of 71°·5, and the mean coolest, Port Nolloth, with 61°·1, a difference of 10°·4. The highest mean maximum (84°) belongs to Mochudi, and the lowest mean minimum (48°·8) to Hanover. The mean of the extreme maximum readings for the month at all stations was 92°·6 or 3°·7 lower than during the previous month, but 4°·5 higher than during March, 1910; and the corresponding value of the minimum readings (46°·4) was 6°·1 lower than in February, but 0°·3 higher than during the corresponding month of last year. The mean monthly range was therefore 46°·2 or 2°·4 greater than last month, and 1°·9 greater than in March, 1910. (In the Orange Free State, the similar values—85°·8 and 41°·3 respectively—were 6°·2 and 7°·1 lower than the corresponding values during February.) The highest day readings were recorded principally during the first six days of the month and on the 18th, but also occurred on 11th to 13th, 25th to 27th, and on 30th and 31st. The extreme minima were generally registered during a cool spell from 21st to 27th, principally on 22nd to 24th, but also occurred on 4th, 12th, 16th, 29th, and 30th. The highest reading of the month was 100°·3 at Dunbrody on 4th, and the lowest (39°) at Murraysburg on 21st and Hanover on 22nd and 23rd. The only other stations with temperatures of 100° F. were Port Nolloth on 25th and Groot Drakenstein on 4th. The extreme monthly range was therefore 61°·3. *Frosts* were reported as occurring at six stations on four days—22nd, 23rd, 26th, and 30th—but were slight, no damage being reported. At Retreat, in the Cape Peninsula, the mean minimum on grass was 50°·8 or 5°·4 lower than the shade minimum and 0°·2 lower than the grass temperature in March of last year. The mean amount of *cloud* over the country was 42 per cent. or the same as in February, but 12 per cent. less than in March, 1910. In general terms, it may be said that the amount of sky obscured was about 35 per cent. in the West and South-west, increasing to 48 per cent. along the South Coast and over the South-east, and to 53 per cent. over Kaffraria, but decreasing to 30 to 40 per cent. over the central portions of the country and to under 30 per cent. over Bechuanaland, but rising to 55 per cent. at Hopefountain. The cloudiest station was Port St. John's with 71 per cent., whilst the clearest skies were experienced at Mochudi with 24 per cent. *Fogs* and *mists* were less numerous than in the previous March, but slightly in excess of the number noted during February, 154 instances of this phenomenon being noted, occurring on each day of the month, but most widely from 7th

to 10th and being most numerously reported on 8th and 10th. The prevalent *wind* directions were SE. at O'okiep, northerly at Port Nolloth, south-easterly over the South-west, westerly along the coast, south-westerly at Durban, southerly (SE. to SW.) over the interior, SE. at Hopefountain, and NE. at Mochudi. The mean force of the morning winds on the Beaufort Scale was 1·72, corresponding to a velocity of 7·2 miles per hour or slightly less than during the preceding month and 0·3 mile per hour less than in March of last year. The winds were strongest in the West and South-west, decreasing eastwards and inland. The Royal Observatory records show a marked increase in winds from SSE. with smaller excesses of those from SE. and SSW., but a decrease of all others, particularly of true southerly and west-north-westerly breezes. The mean velocity was 7 miles per hour or 1·1 miles per hour less than usual. The most noteworthy feature of the winds over the Cape Peninsula during the period December-March has been the marked decrease of north-westerly winds with a counter-balancing increase of those from SSE., partly at the expense of those from due south. Four *hot winds* were noted during the month on three days, and one *duststorm*. Strong winds and *gales* were more frequent than during last February or the previous March, 19 being reported on 14 days, chiefly on 4th, 21st, and 24th.

The mean pressure at the Royal Observatory was 30·01 inches or 0·03 inch higher than usual, ranging from 30·37 inches on the morning of the 22nd to 29·76 inches on the morning of the 4th.

TEMPERATURE.

Station.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Royal Observatory ...	79·7	59·2	69·4	96·8	4th	50·4	22nd
Bishopscourt	76·5	53·4	65·0	93·2	18th	42·5	24th
Retreat	78·8	56·2	67·5	97·6	18th	43·7	22nd
Wynberg...	78·9	57·9	68·4	95·5	4th & 18th	47·0	22nd
Groot Constantia	76·7	58·3	67·5	94·0	4th	49·0	21st
South African Coll. (Capetown)	82·1	59·8	71·0	99·5	25th	52·0	30th
Blaauwberg	74·2	58·5	66·4	96·0	18th	53·0	30th
Groot Drakenstein ...	83·8	59·5	71·6	100·0	4th	48·6	30th
Point Danger	70·9	57·6	64·2	88·0	18th	53·0	29th
Elsenberg	80·9	58·2	69·5	96·5	25th	48·1	22nd
Port Nolloth	69·4	52·8	61·1	100·0	25th	47·0	23rd
O'okiep	82·2	58·2	70·2	96·0	3rd	47·5	22nd
Port Elizabeth	75·0	61·7	68·4	86·0	5th	53·0	22nd
Cape St. Francis	69·8	61·0	65·4	76·0	27th	54·0	24th
Heidelberg	81·8	55·1	68.4	98·0	18th	36·0	12th
Dunbrody	83·5	58·5	71·0	100·3	4th	46·2	24th & 4th
Cape Agulhas	72·7	60·8	66·8	96·0	18th	54·0	22nd & 29th
Storms River	75·9	58·2	67·0	95·0	26th	50·7	23rd & 24th
Amalienstein	82·3	57·0	69·6	92·0	11th	43·0	22nd
Hanover	78·7	48·8	63·8	89·0	2nd	39·0	22nd & 23rd
Murraysburg	79·2	52·5	65·8	93·0	4th	39·0	21st
Kimberley	82·6	57·5	70·0	95·3	1st	45·3	24th
Sydney's Hope	76·2	59·7	68·0	92·7	6th	47·5	22nd
Bedford	76·8	55·3	66·0	95·0	5th	44·0	16th
Kingwilliamstown... ...	80·6	58·8	69·7	95·0	30th	47·0	23rd
Cathcart	71·8	53·3	62·5	84·8	6th	42·2	23rd
Aliwal North	78·0	50·7	64·4	85·5	13th	41.5	24th & 25th
Queenstown	76·1	53·9	65·0	90·0	1st	41·0	23rd
Umtata	78·0	57·5	67·8	97·0	31st	45·0	24th
Kokstad	72·3	51·2	61·8	86·6	1st	39·1	23rd
Tabankulu	74·2	53·1	63·6	87·8	31st	42·0	23rd
Port St. John's	75·8	63·6	69·7	85·0	2nd	56·0	23rd
Teyteyaneng	74·3	50·3	62·3	87·0	2nd	39·0	23rd
Mochudi	84·0	59·0	71·5	94·0	12th & 13th	52·0	27th
Cumnor	82·3	57·2	69·8	97·0	3rd	47·0	25th & 26th
Hopefountain	73·4	54·9	64·2	82·8	13th	46·6	26th
Means	77·5	56·6	67·1	92·6	—	46·4	—
Extremes ...	—	—	—	100·3	3rd	39·0	21st

OBSERVERS' NOTES.

Groot Drakenstein.—Mean temperature of month 0°·9 above the average. Rainfall a little less than half the average. The month was warm, dry, and windy, strong south-easters being much in evidence in the early part. Frequent light showers fell, but not enough to do any good. Total rainfall for the first quarter of 1911 was 2·02 inches.

Kokstad (Coyte).—Good rains fell during the month, but too late for the mealie crops, which have suffered somewhat in consequence. The mean temperature of the month was below the average.

Vruchtbaar (Wellington).—A very dry month, but excellent for the preparation of raisins and all kinds of dried fruits, of which the crops are heavy and the quality extra.

Kruis River.—A nice rainfall, but ·07 less than the corresponding month of 1910. However, a good bit of ploughing has been done. Crops of rape, barley wheat, barley, and late beans have been sown and have germinated very well, but much remains to be done yet for the forage crop. The weather during the month has been very hot. One very hot wind on the 28th. Heavy dews almost every morning. Stock in good condition.

Uitenhage Park.—A warm month, but only one true hot wind. Rainfall above the average of past nine years.

New Bethesda.—River in flood five times during month. The country looking quite different to what it was a month ago. The rains made a wonderful difference and we are fairly set up for the winter now.

Ryedale (Aberdeen).—Veld in splendid order, as all the late rains have been soaking ones with very little run-off.

De Kruis (Murraysburg).—Heavy rain on 27th (2·97 inches); terrible flow of water; washed away lots of soil, fences, and walls round lands.

Theefontein (Hanover).—Rains this month fairly general over district; lighter in some parts and others amounting to floods, doing considerable damage. Veld growing out well and stock in good condition.

Sunnyside (Hay).—The fine rains during this month were only just in time to save this drought-stricken country from inevitable ruin, and it seems almost impossible to believe that these sun-scorched hills and plains could have changed, in so short a space of time, to the veritable flower gardens which they now so strikingly resemble. Locusts, too, have disappeared entirely, consequently there is every hope for the grass to ripen thoroughly before winter sets in. All crops in splendid condition. Stock fattening beautifully and free from the diseases prevalent during this time of the year, such as blue-tongue, horse-sickness, etc.

Huxley (Stutterheim).—Live stock doing well. Too much rain for growing crops. Rivers impassable for several days.

Clifton (Sterkstroom).—Satisfactory month; promises well for winter. Frosts did no damage here. Ploughing going ahead.

Edendale (Glen Grey).—Terrific hailstorm on 29th; stones size of hen's eggs; tremendous lot of damage to crops and stock.

Herschel.—Mealie and kaffir corn only crops; former not very promising, latter fairly so.

Sunnymeade (Albert).—Lovely rains; just in time to allow the veld to recover before the winter sets in. Stock doing well.

Elliotdale.—East Coast fever in district.

Armadillo Creek (Vryburg).—We have had bad luck, missing several useful storms. Rain has come in time for winter veld, but too late for crops generally.

TRANSVAAL.

OBSERVERS' WEATHER REPORTS FOR MARCH.

SUMMARY.—In the south-western and south-eastern districts, the eastern high veld, and the vicinity of Pietersburg, the rainfall for the month has exceeded the average. The remaining portions of the Province generally show a deficiency. The rainfall for the season (nine months) is generally deficient; the neighbourhood of Pietersburg, and the Barberton, south-eastern, and south-western districts (not including Bloemhof) are the only exceptions. The shortage over the north-western border and eastern high veld is considerable.

BARBERTON DISTRICT—

***Barberton.*—There have been great variations in temperature during the month; at the commencement and end of the month it was warmer and colder than usual. There were two or three good rains which came at the right time for the winter crops. (A. C. Jackman.)**

BLOEMHOF DISTRICT—

***Christiana.*—Good soaking rains fell between the 1st and 22nd, which only came in time to save the stock farmers from great loss; the veld is looking green. (S. W. Davis.)**

CAROLINA DISTRICT—

Diepgezet.—Late in February frost was noticed. From 8th March to 18th March rain fell freely at night. Heavy wet mists prevailed during the month several cold snaps following rains. From 21st to 31st of the month warm and dry weather was experienced. Native crops have suffered severely this season. (J. T. W. Archibald.)

ERMELO DISTRICT—

Elspan.—During the first part of the month cold south-easterly winds prevailed, but the latter part of the month has been exceptionally warm. (A. Middleton.)

Government Nursery.—Winds, chiefly light, and mostly from the east, were experienced. The weather on the whole was damp and moist and cloudy. Very little sunshine was experienced during the month. (A. Drummond.)

LICHTENBURG DISTRICT—

Doornbult.—No " downpours " have been experienced during the month, rain registered has been steady, soaking showers. Our winter grazing is now assured. (J. G. Smith.)

LYDENBURG DISTRICT—

Belfast.—Welcome rains fell during the month. The first portion of March was warm, but the weather got much cooler towards the close. Strong, cold, drying winds were experienced at intervals. Ground frosts were recorded on the mornings of the 26th and 28th. (G. J. Imrie.)

Bushbuck Ridge.—The late rains have greatly improved the condition of the few standing crops, especially cotton, which promises an A1 crop. The water supply in the spruits has much improved. (Colonel F. Steinacker.)

Lydenburg.—The rain came too late to be of any use to the crops. (Sergt. Caldwell, T.P).

MARICO DISTRICT—

Lead Mines.—Good, steady rains were experienced this month; the veld is greatly improved. (Lance-corporal C. Hains, T.P.)

MIDDELBURG DISTRICT—

Middelburg.—There has been a steady decrease in the temperature during the month in spite of the recording of a shade maximum of 89° on the 10th, the mean falling 2°, as it has done monthly since January. The prevailing winds have been south-easterly and north-westerly, the former predominating slightly. What promised to be a drought serious to crops was happily averted by the heavy rainfall on the 10th, ushering in a fortnight's good rains and a general recovery of the crops. Thus, on the 10th, 2·78 inches fell during the evening and night in three and a half hours, and was followed by a further 2·24 inches during the following night—just over 5 inches in forty-eight hours. The rainfall for the month establishes a record since the commencement of taking observations, being almost 4 inches above the average, and almost 2 inches more than that recorded in March, 1909. The fall this season is already 1 inch more than last. (Dr. H. A. Spencer.)

POTCHEFSTROOM DISTRICT—

Machavie.—It drizzled steadily, with overcast skies, for almost two weeks. Stormy winds were absent; the weather continued beautifully mild throughout. (V. Glaeser.)

SWAZILAND—

Piggs Peak.—The weather was showery up to the 23rd. From that date to the end of the month there was every indication of approaching winter. (Sergt. S. B. Williams, T.P.)

ZOUTPANSBERG DISTRICT—

Krabbefontein.—Misty, cloudy weather was experienced almost the whole month. (G. F. Savage.)

Louis Trichardt.—The heaviest single rainfall occurred between 3 p.m. on 13th and 9 a.m. on 14th of March, when dense thunderclouds passed overhead from all quarters. During the night that intervened the downpour was steady and continuous, and gradually slackened off during the ensuing day, until it resembled the fine, misty rain, or " Scotch mist ", which has been the invariable character of the remaining deposits during the month. The cloudy mornings which characterized February have continued up to the beginning of the last week in March, but the month ended with delightfully bright weather, with extremely brilliant sunrises and sunsets. The nights have been cool. Fever has not yet become at all prevalent, though several cases have been reported from the north of the mountains. (Sergeant J. C. N. Clark, T.P.)

Mamathola.—There has been a good, quiet, steady rainfall during the month, which, however, arrived too late to save the late sown maize. (H. W. Molyneux.)

Middelrand.—We have had by no means a bad season, though rain is decidedly on the short side. Crops are in good condition. (A. W. Gale.)

Pietersburg.—Splendid rains fell during this month; genial days, but hot and sultry towards the close of the month, were experienced. (W. J. Frankleyne.)

Rainfall, March, 1911.

CAPE PROVINCE.

I. CAPE PENINSULA :	Inches.
Royal Observatory (*a*) 12-inch gauge	0·26
Capetown (Fire Station) ...	0·15
Do. (South African College)	0·22
Do. (Molteno Reservoir) ...	0·40
Do. (Platteklip)	0·84
Do. (Signal Hill)	0·34
Sea Point (The Hall)	0·25
Camps Bay	0·25
Table Mountain (Disa Head) ...	1·07
Do. (Kasteel Poort)	1·81
Do. (Waai Kopje) ...	1·84
Do. (St. Michael's)...	2·37
Bishopscourt	0·79
Kenilworth	0·75
Wynberg (St. Mary's)	0·55
Groot Constantia...	0·73
Tokai Plantation	0·84
Muizenburg (St. Res.)	0·99
Cape Point	0·27
Blaauwberg Strand	0·21
Robben Island	0·20
Maitland Cemetery	0·09
Tamboers Kloof	0·33
Woodhead Tunnel	1·13
Lower Reservoir	0·37
MacLears Beacon	2·22
Waai Vlei	2·11
Woodhead Dam	1·76
Muizenberg (Rustenvrede) ...	0·40

II. SOUTH-WEST :	
Eerste River	0·41
Stellenbosch (Gaol)	0·78
Somerset West	0·97
Paarl	0·60
Wellington (Gaol)	0·54
Groot Drakenstein (Weltevreden)	0·64
Porterville Road	0·29
Tulbagh	0·35
Kluitjes Kraal	0·17
Ceres	0·00
Rawsonville	0·24
Caledon	0·80
Worcester (Gaol)...	0·05
Karnmelks River...	0·40
Lady Grey (Division Robertson).	0·11
Robertson (Gaol)...	0·45
Do. (Govt. Plantation) ...	0·46
Montagu	0·08
Danger Point	0·22
Elgin Plantation	0·85
Elsenburg Agricultural College...	0·48

II. SOUTH-WEST (*continued*):	Inches
Roskeen	0·66
Vruchtbaar	0·78
Agric. Exp. Farm (Robertson) ...	0·44
Ceres (Heatlie)	0·57
Waverley (Tulbagh)	0·33
Dwaars Riviers Hoek	0·58

III. WEST COAST :	
Port Nolloth	0·00
Anenous	0·00
Klipfontein	0·00
Kraaifontein	0·00
O'okiep	0·63
Springbokfontein...	0·30
Concordia	0·47
Concordia (Kraphol)	0·00
Lilyfontein	0·17
Van Rhyn's Dorp	0·53
Dassen Island	0·26
Kersefontein	0·32
The Towers	0·40
Malmesbury	0·34
Piquetberg	0·60
Hopefield	0·22
Algeria (Clanwilliam)	0·29
Cedarberg (Clanwilliam) ...	0·36

IV. SOUTH COAST :	
Cape Agulhas	0·53
Swellendam	2·11
Grootvaders Bosch	4·20
Heidelberg	0·34
Riversdale...	1·05
Vogel Vlei...	1·96
Mossel Bay	0·73
Great Brak River	1·63
George	3·10
George (Plantation)	2·88
Millwood	4·73
Buffel's Nek	3·07
Harkerville	2·56
Blaauwkrans	3·35
Lottering	4·33
Storms River	3·43
Witte Els Bosch	3·96
Humansdorp	1·86
Cape St. Francis	1·30
Kruis River	2·38
Uitenhage (Gaol)...	2·42
Do. (Park)...	2·31
Do. (Inggs)	2·53

IV. SOUTH COAST (*continued*):

	Inches.
Dunbrody	2·14
Port Elizabeth (Harbour)	1·68
Do. (The Slip)	2·21
Do. (Walmer Heights)	2·68
Shark's River	1·98
Centlivres	1·85
Edinburgh (Knysna)	2·56
Gamtoos Station	1·42

V. SOUTHERN KAROO:

Triangle	0·46
Pietermeintjes	1·18
Ladismith	0·72
Amalienstein	0·98
Calitzdorp	1·30
Oudtshoorn	1·32
Vlaakte Plaats	1·21
Uniondale	0·89

VI. WEST CENTRAL KAROO:

Prince Albert	0·95
Dunedin	2·10
Nels Poort	1·74
Camfers Kraal	1·36
Krom River	2·01
Roosplaats	2·05
Lemoenfontein	2·03
Merweville	1·50
Baakens Rug	2·02
Willowmore	0·96
Rietfontein	1·06
Steytlerville	1·61

VII. EAST CENTRAL KAROO:

Aberdeen (Gaol)	2·24
Aberdeen Road	1·25
Klipplaat	0·86
Winterhoek	3·44
Graaff-Reinet (Gaol)	2·59
Do. (Eng. Yard)	2·35
New Bethesda	3·94
Roodebloem	2·12
Glen Harry	2·67
Wellwood	4·67
Bloemhof	3·75
Jansenville	1·33
Roode Hoogte	4·47
Toegedacht	1·61
Klipfontein	2·36
Middlewater	1·93
Somerset East (Gaol)	5·10
Middleton	5·64
Spitzkop (Graaff-Reinet)	2·75
Gordonville (Graaff-Reinet)	4·83
Muchputfontein	1·57
Zeekoe River	3·06

VIII. NORTHERN KAROO:

Calvinia	0·58
Fraserburg	0·73
Carnarvon	3·90
Brakfontein	3·17
Victoria West	3·79

VIII. NORTHERN KAROO (*continued*):

	Inches.
Britstown	2·64
Wildebeestkooij	3·87
Murraysburg	3·30
De Kruis (Murraysburg)	5·05
Richmond	3·41
Hanover	2·31
Theefontein	3·35
Philipstown	5·80
Petrusville	3·43
The Willows (Middelburg)	2·98
Colesberg	4·52
Tafelberg Hall	3·97
Varkens Kop	3·31
Culmstock	4·59
Cradock (Gaol)	3·58
Witmoss	3·00
Maraisburg	3·83
Steynsburg (Gaol)	4·34
Tarkastad	4·86
Drummond Park	6·80
Waverley	5·00
Schuilhoek	5·63
Vosburg	4·20
Zwavelfontein	3·87
Hotweg Kloof (Cradock)	3·36
Thebus Waters	4·07
Ruightersfontein	4·93
Klipkraal	3·13
Geelbeksfontein	6·42

IX. NORTHERN BORDER:

Pella	1·16
Kenhardt	2·39
Upington	5·20
Van Wyks Vlei	1·79
Prieska	4·21
New Year's Kraal	3·63
Dunmurry	8·10
Karree Kloof	4·20
Griquatown	5·91
Douglas	6·97
Orange River	4·94
Newlands (Barkly West)	4·13
Barkly West	2·71
Kimberley Stepheus	3·29
Strydenburg	4·32
Douglas (Voss)	6·49
Rietfontein (Gordonia)	4·45
Stoffkraal (Prieska)	3·00
Sunnyside (Hay)	4·64
Rocklands	2·41
Peters Park (Gordonia)	4·47
Sydney-on-Vaal	5·05
Warrenton	3·94

X. SOUTH-EAST:

Melrose (Division Bedford)	3·76
Dagga Boer	3·89
Lynedoch	3·85
Alicedale	2·35
Bedford (Hall)	6·40
Sydney's Hope	3·21
Cullendale	5·10
Adelaide	3·99

X. SOUTH-EAST (*continued*):

	Inches.
Atherstone	3·20
Alexandria	4·28
Fort Fordyce	6·89
Grahamstown (Gaol)	4·81
Heatherton Towers	3·83
Sunnyside	4·50
Fort Beaufort	4·12
Katberg	11·20
Seymour	6·95
Glencairn	8·81
Port Alfred	3·91
Hogsback	12·17
Peddie	4·16
Exwell Park	4·50
Keiskamma Hoek	6·06
Cathcart (Gaol)	6·63
Cathcart (Forman)	6·57
Cathcart	8·45
Thaba N'doda	9·14
Evelyn Valley	15·40
Crawley	5·37
Pirie Forest	7·06
Forestbourne	12·89
Isidenge	11·06
Kologha	10·61
Kingwilliamstown (Gaol)	4·90
Do. (Pym)	5·31
Fort Cunynghame	7·41
Kubusie	11·06
Quacu	7·74
Blaney	4·66
Kei Road	8·40
Bolo	6·06
Fort Jackson	2·80
Prospect Farm (Komgha)	6·70
Komgha (Gaol)	5·92
Chiselhurst	6·49
Cata	11·43
Wolf Ridge	9·79
Dontsah	10·42
Mount Coke	6·30
Albert Vale (near Bedford)	4·23
Huxley Farm (Stutterheim)	7·67
Amabele Junction	6·67
Insileni	6·37
Eastover	5·48

XI. NORTH-EAST:

Venterstad	4·79
Mooifontein	6·34
Burnley (Cyphergat)	5·60
Ellesmere	6·15
Lyndene	4·94
Thibet Park	5·43
Sterkstroom (Gaol)	6·15
Rocklands	5·25
Aliwal North (Gaol)	3·72
Poplar Grove	6·00
Carnarvon Farm	5·35
Jamestown	3·77
Whittlesea	4·65
Queenstown (Gaol)	2·96
Do. (Beswick)	4·82
Middlecourt	7·26
Dordrecht	6·53

XI. NORTH-EAST (*continued*):

	Inches.
Herschel	6·53
Lady Grey	7·54
Lauriston	5·02
Lady Frere	5·71
Keilands	4·88
Barkly East	4·37
Hughenden	4·49
Glenwallace	6·28
Indwe (Collieries)	4·49
Bensonvale Inst. (Herschel)	5·84
Sunnymeade (Division Albert)	7·91
Clifton (Sterkstroom)	5·03
Edendale	6·91

XII. KAFFRARIA:

Ida (Xalanga)	6·18
Slaate (Xalanga)	6·93
Cofimvaba	7·76
Tsomo	5·90
N'qamakwe	5·33
Engcobo	6·26
Butterworth	5·18
Kentani	7·02
Maclear	5·96
Do. (Station)	6·53
Bazeya	8·92
Willowvale	8·04
Mount Fletcher	4·87
Somerville (Tsolo)	5·33
Elliotdale	6·17
Umtata	4·15
Cwebe	10·93
Tabankulu	6·09
Kokstad	5·22
Do. (The Willows)	4·70
Flagstaff	7·49
Insikeni	7·27
Port St. Johns	8·88
Umzimkulu	3·03
Wanstead	3·42
Lusikisiki	7·18
Tentkop (Elands Height)	9·40
Elton Grange	4·48
Ndabakazi	5·78

XIII. BASUTOLAND:

Mohalies Hoek	8·42
Maseru	5·12
Teyatcyaneng (Berea)	4·84
Moyeni Quthing	6·52
Qachas Nek	9·20

XIV. BECHUANALAND:

Taungs	3·64
Vryburg	4·30
Mafeking	6·09
Kuruman	2·10
Zwartlaagte	5·98
Nottinghame	6·16
Armadillo Creek	2·82
Mochudi	1·60
Morokwen	4·91

NATAL.

	Inches.		Inches.
Umhlangeni (Lower Umzimkulu) ...	5·03	Milkwood Kraal	3·30
Winkel Spruit	8·60	Blackburn	6·03
Ottawa	5·79	Cedara (Vlei)	4·08
Mount Edgecombe	5·16	Giant's Castle	4·93
Cornubia	6·04	Weenen	5·71
Saccharine	5·07		

TRANSVAAL.

Barberton	3·96	Pretoria (Arcadia)	2·28
Komatipoort	1·42	Modderfontein	3·45
Bethal	2·63	Rustenburg	3·30
Christiana	3·49	Standerton	1·96
Carolina	3·16	Mbabane	9·44
Ermelo	3·80	Volksrust	3·99
De Hoop	2·81	Wakkerstroom	4·52
Vereeniging	2·86	Nylstroom	0·93
Heidelberg	1·52	Potgietersrust	2·58
Lichtenburg	5·28	Krugersdorp	2·17
Pilgrims Rest	4·85	Joubert Park	2·94
Belfast	4·65	Observatory	2·59
Zeerust	5·35	Wolmaransstad	9·19
Middelburg	7·08	Pietersburg	4·44
Piet Retief	4·81	Louis Trichardt	4·29
Potchefstroom	2·08	Leydsdorp	3·27
Klerksdorp	2·81		

Rainfall, April, 1911.

CAPE PROVINCE.

I. CAPE PENINSULA:	Inches.
Royal Observatory (a) 12-inch gauge	1·77
Capetown (Fire Station)	1·03
Do. (South African College)	1·17
Do. (Molteno Reservoir)	1·38
Do (Platteklip)	1·92
Do. (Signal Hill)	0·51
Sea Point (The Hall)	0·54
Camp's Bay	1·65
Table Mountain (Disa Head)	2·04
Do. (Kasteel Poort)	3·66
Do. (Waai Kopje)	4·55
Do. (St. Michael's)	4·85
Newlands (Montebello)	2·26
Bishopscourt	1·48
Kenilworth	0·79
Wynberg (St. Mary's)	0·70
Groot Constantia	0·98
Tokai Plantation	1·04
Muizenberg (St. Res.)	1·33
Cape Point	0·41
Blaauwberg Strand	0·42
Robben Island	0·91
Maitland Cemetery	1·33
Tamboers Kloof	0·85
Woodhead Tunnel	3·16
Lower Reservoir	1·41
MacLear's Beacon	4·63
Waai Vlei	5·08
Woodhead Dam	3·55
Muizenberg (Cooper)	0·75

SOUTH-WEST:	
Eerste River	0·65
Klapmuts	1·45
Stellenbosch (Gaol)	1·33
Paarl	1·98
Wellington (Gaol)	2·23
Groot Drakenstein (Weltevreden)	1·47
Porterville Road	0·42
Tulbagh	0·32
Ceres Road	1·10
The Oaks	0·40
Rawsonville	0·27
Caledon	0·54
Worcester (Gaol)	0·03
Hex River	0·12
Karnmelks River	0·18
Lady Grey (Division Robertson)	0·09
Robertson (Gaol)	0·12
Do. (Govt. Plantation)	0·04

II. SOUTH-WEST (continued):	Inches.
Montagu	0·27
Danger Point	0·70
Elsenberg Agricultural College	1·27
Roskeen	0·76
Vruchtbaar	1·91
Ag. Exp. Farm	0·26
Ceres (Heatlie)	1·06
Waverley (Tulbagh)	0·62
Dwaars Riviers Hoek	2·38

III. WEST COAST:	
Port Nolloth	0·00
Anenous	0·20
Klipfontein	0·30
O'okiep	0·09
Springbokfontein	0·22
Concordia	0·00
Garies	0·10
Van Rhyn's Dorp	0·07
Dassen Island	0·23
Kersefontein	0·35
The Towers	0·26
Malmesbury	0·19
Piquetberg	1·30
Wupperthal	0·09
Hopefields	0·25
Algeria (Clanwilliam)	0·49
Cedarberg (Clanwilliam)	0·61

IV. SOUTH COAST:	
Cape Agulhas	0·45
Swellendam	0·94
Grootvaders Bosch	2·54
Heidelberg	0·48
Riversdale	1·10
Vogel Vlei	0·64
Mossel Bay	0·38
Great Brak River	0·99
George	1·73
George (Plantation)	2·08
Sour Flats	2·00
Buffels Nek	3·01
Plettenberg Bay	2·03
Harkerville	2·10
Blaauwkrantz	1·40
Lottering	1·70
Witte Els Bosch	3·13
Humansdorp	0·98
Cape St. Francis	1·59
Kruis River	1·54

IV. SOUTH COAST (*continued*):	*Inches.*
Uitenhage (Gaol)	1·62
Do. (Park)	1·84
Do. (Inggs)	1·77
Armadale (Blue Cliff)	1·68
Dunbrody	0·96
Port Elizabeth (Harbour)	2·40
Do. (The Slip)	2·47
Do. (Walmer Heights)	2·98
Shark's River (Nursery)	2·63
Centlivres	0·68
Edinburgh (Knysna)	2·09
Gamtoos Station	2·02

V. SOUTHERN KAROO:	
Triangle	0·05
Pietermeintjes	0·35
Ladismith	1·06
Amalienstein	1·98
Calitzdorp	0·64
Oudtshoorn	0·95
Vlaakte Plaats	1·05
Uniondale	0·45

VI. WEST CENTRAL KAROO:	
Prince Albert	0·70
Beaufort West (Gaol)	2·64
Dunedin	1·50
Nel's Poort	2·15
Camfers Kraal	3·61
Krom River	1·18
Roosplaats	0·98
Lemoenfontein	3·55
Baaken's Rug	3·22
Willowmore	1·17
Rietfontein	1·41
Steytlerville	0·67

VII. EAST CENTRAL KAROO:	
Aberdeen (Gaol)	2·05
Aberdeen Road	2·23
Klipplaat	1·95
Klipdrift	1·36
Kendrew (Holmes)	1·92
Graaff-Reinet (Gaol)	1·91
Do. (Eng. Yard)	1·98
New Bethesda	1·77
Roodebloem	1·41
Glen Harry	3·19
Wellwood	2·24
Jansenville	2·08
Roode Hoogte	2·31
Toegedacht	1·88
Klipfontein	2·42
Cranemere	2·00
Middlewater	2·39
Spitzkop (Graaff-Reinet)	3·15
Grobbelaar's Kraal	1·68
Muchputfontein	3·03
Zeekoe River	1·70

VIII. NORTHERN KAROO:	*Inches.*
Calvinia	0·00
Sutherland	1·31
Fraserburg	1·06
Carnarvon	0·17
Brakfontein	1·91
Britstown	2·67
Wildebeestkooij	1·46
Murraysburg	2·05
De Kruis (Murraysburg)	2·22
Richmond	2·68
Hanover	2·68
Theefontein	3·03
Philipstown	3·09
Petrusville	2·44
The Willows (Middelburg)	3·34
Colesberg	1·81
Tafelberg Hall	2·10
Fish River	1·69
Culmstock	1·73
Cradock (Gaol)	2·38
Maraisburg	2·63
Steynsburg (Gaol)	1·53
Hillmoor	3·27
Tarkastad	2·31
Drummond Park	2·21
Waverley	2·05
Schuilhoek	3·06
Vosburg	2·52
Zwavelfontein	1·36
The Lands, Richmond	4·01
Elands Vlei (Calvinia)	0·14
Zoet Vlei (Richmond)	2·86
Klipkraal (Richmond)	2·39
Hotweg Kloof (Cradock)	2·23
Thebus Waters	1·93
Ruightersfontein	2·70

IX. NORTHERN BORDER:	
Pella	0·00
Kenhardt	1·04
Upington	0·55
Trooilapspan	0·59
Van Wyk's Vlei	2·34
Prieska	2·36
New Year's Kraal	1·68
Dunmurry	1·27
Karree Kloof	2·07
Griquatown	3·29
Douglas	1·38
Douglas (Vos)	1·29
Hope Town	1·54
Newlands (Barkly West)	1·94
Barkly West	0·47
Kimberley (Stepheus)	0·67
Strydenburg	1·52
Rietfontein (Gordonia)	0·10
Stoffkraal (Prieska)	0·95
Sunnyside (Hay)	0·95
Peter's Park (Gordonia)	0·92
Sydney-on-Vaal	0·78
Warrenton	0·96

X. SOUTH-EAST:	
Melrose (Div. Bedford)	2·29
Dagga Boer	3·76
Lynedoch	2·31
Alicedale	1·87
Cheviot Fells	5·35
Bedford (Gaol)	4·50
Do. (Hall)	4·14

X. SOUTH-EAST (*continued*):

	Inches.
Sydney's Hope	3·57
Adelaide	2·90
Atherstone	2·36
Alexandria	2·99
Fort Fordyce	5·93
Grahamstown (Gaol)	2·97
Heatherton Towers	3·38
Sunnyside	2·30
Fort Beaufort	3·40
Katberg	6·00
Seymour	2·69
Glencairn	3·05
Port Alfred	2·45
Hogsback	6·17
Peddie	2·47
Exwell Park	2·71
Keiskamma Hoek	2·66
Cathcart (Gaol)	2·51
Cathcart (Forman)	2·60
Cathcart	3·30
Thaba N'doda	6·02
Evelyn Valley	7·05
Crawley	2·46
Pirie Forest	3·61
Isidenge	3·23
Kologha	3·14
Kingwilliamstown (Gaol)	1·22
Fort Cunynghame	4·60
Kubusie	3·24
Quacu	2·68
Blaney	0·80
Kei Road	2·56
Berlin	3·41
Bolo	1·92
Prospect Farm (Komgha)	2·16
Komgha (Gaol)	2·03
Chiselhurst	2·40
Cata	3·04
Wolf Ridge	5·49
Dontsah	3·02
Mount Coke	1·30
Albert Vale (near Bedford)	2·80
Huxley Farm (Stutterheim)	2·05
Amabele Junction	2·96
Insileni (Kingwilliamstown)	2·76
Kingwilliamstown (Pym)	1·77
Woodlands (Fish River Rand)	3·23
Eastover	2·10

XI. NORTH-EAST:

	Inches.
Venterstad	2·42
Mooifontein	3·38
Burghersdorp (Gaol)	3·75
Broughton (Molteno)	4·19
Lyndene	3·54
Thibet Park	2·64
Sterkstroom (Gaol)	1·99
Rocklands	2·52
Aliwal North (Gaol)	2·43
Poplar Grove	2·85
Jamestown	3·61
Queenstown (Gaol)	2·36
Dordrecht	2·41
Herschel	3·56
Lady Grey	3·56

XI. NORTH-EAST (*continued*):

	Inches.
Lady Frere	2·16
Keilands	1·22
Barkly East	2·28
Hughenden	2·56
Glenwallace	2·10
Indwe (Collieries)	2·94
Bensonvale Inst. (Herschel)	3·76
Sunnymeade (Albert)	2·25
Clifton (Sterkstroom)	2·18
Edendale	2·19
Strydpoort (Dordrecht)	2·09

XII. KAFFRARIA:

	Inches.
Ida (Xalanga)	2·76
Slaate (Xalanga)	3·36
Cofimvaba	2·37
Tsomo	1·66
N'qamakwe	1·89
Engcobo	3·51
Butterworth	1·74
Woodcliff	3·13
Kentani	2·38
Maclear	3·51
Bazeya	3·88
Willowvale	2·69
Somerville (Tsolo)	2·55
Elliotdale	2·49
Cwebe	4·81
Tabankulu	2·22
Kokstad	1·40
Kokstad (The Willows)	1·40
Flagstaff	3·14
Insikeni	3·71
Port St. Johns	6·17
Umzimkulu	2·52
Umzimkulu (Strachan)	2·11
Wanstead	2·28
Maclear (Station)	3·72
Lusikisiki	5·06
Tentkop (Elands Height)	3·17
Elton Grange (Mount Currie)	1·40
Dihota	0·87
N'dabakazi	1·38
Clarkbury (Engcobo)	2·20

XIII. BASUTOLAND:

	Inches.
Mohalies Hoek	2·44
Maseru	3·40
Teyateyaneng (Berea)	2·78
Moyeni Quthing	2·94
Qacha's Nek	5·29

XVII. BECHUANALAND:

	Inches.
Taungs	1·52
Vryburg	0·88
Mafeking	1·34
Kuruman	0·54
Zwartlaagte	1·08
Nottinghame (Mafeking)	0·77
Masilibitsani	0·34
Armadillo Creek	0·75
Mochudi	0·45
Morokwen	0·51

NATAL.

	Inches.
Umhlangeni (Lower Umzimkulu)	5·08
Winkel Spruit	9·38
Ottawa	2·86
Mount Edgecombe	3·[illegible]
Cornubia	4·71
Saccharine	2·76
Milkwood Kraal	1·60
Blackburn	4·02
Cedara (Hill)	2·00
Cedara (Vlei)	1·66
Giant's Castle	3·95
Weenen	1·65

TRANSVAAL.

Barberton	1·90
Komatipoort	1·20
Bethal	2·82
Christiana	0·68
Carolina	3·96
Ermelo	2·42
De Hoop	4·38
Heidelberg	2·08
Lichtenburg	0·78
Pilgrims Rest	4·40
Belfast	4·38
Zeerust	1·84
Middelburg	3·73
Piet Retief	2·53
Potchefstroom	2·73
Klerksdorp	3·76
Pretoria (Arcadia)	2·32
Modderfontein	2·63
Rustenburg	1·97
Standerton	2·24
Mbabane	2·82
Volksrust	1·65
Wakkerstroom	1·66
Nylstroom	2·28
Potgietersrust	1·82
Krugersdorp	2·10
Joubert Park	3·30
Observatory	2·77
Wolmaransstad	2·60
Pietersburg	1·56
Louis Trichardt	2·05
Leydsdorp	1·49

Departmental Notices.

FARM EMPLOYMENT.

Applicant, aged 16, is desirous of obtaining employment on a farm with a view to learning all he can regarding mixed farming. Is a well-built lad, and anxious to start work, and willing to make himself useful in any capacity.—E. TURNBULL, The Residency, Empangeni, Zululand. [4]

Hard-working energetic farm hand, 24 years of age, with knowledge of common nursery work and forestry (wattles and gums), stock, and general farming, wants situation on farm within five-mile radius from railway station. Good references. Strictly sober.—H. BERNHARD, c/o Wm. Clark, Esq., Kenterton (Private Bag), via Esperanza, Natal. [4]

Applicant, aged 18, desires employment on a farm. Has been brought up on a farm, and understands the handling of sheep, cattle, horses, and general agriculture.—J. L. M. DANIEL, Rietfontein No. 64, Platrand P.O., via Standerton, Transvaal. [5]

Applicant, aged 18, desires employment on a farm. Has had no previous experience of farm work.—G. M. MARITZ, Rietfontein No. 64, Platrand P.O., via Standerton, Transvaal. [5]

Applicant, aged 27, desires to obtain a situation on a farm, anywhere in the Union of South Africa. Accustomed to working with horses, mules, and oxen. Understands all kinds of farming (agricultural and stock), and has had eight years' experience of farming in Natal. Has knowledge of veterinary matters, and understands castration of all classes of stock.—H. H. WILLEY, Dwaar's Nek, Hatting Spruit, Natal. [5]

MR. E. SHARRATT, Brakwal, P.O. V. K. Kop, District Harrismith, Orange Free State, has a vacancy for an apprentice on his farm, where both general and stock farming are carried on. Youngish lad preferred, and one not afraid to work. [6]

Englishman, 19 years old, recently arrived in this country, desires employment on farm. Is strong and healthy and used to hard work.—ERIC SMITH, P.O. Box 1432, Capetown. [6]

Applicant desires employment on a farm.—Address communications to: E. W. McDONALD, Drummond, Whittlesea, Cape Province. [6]

GOVERNMENT STALLIONS FOR LEASE.—SEASON 1911-12.

Applications to hire stallions for next season should be made before 31st July, 1911, on which date these applications will be considered.

As the number of stallions is limited, preference will be given to owners of the best class of mares.

TERMS.

The season will commence on the 1st September.

Stallions will be leased to individuals, associations, or two or more breeders in conjunction, approved of by the Department.

The lessee or lessees to allow the farming public to send mares for service at a fixed fee, provided the list is not already full, the fees to be according to the following tariffs, viz. :—

Prices paid for hire of Stallion.	Fee to be charged by Lessee not to exceed.
£30	30s.
£35	35s.
£40	40s.
£50	50s.
£60	60s.

The charge for the hire of the majority of the stallions will range from £30 to £60, but for a few exceptionally high-class animals somewhat higher rates will be made.

Payment for hire of stallions must be made in advance.

Not more than forty mares may be served by a stallion without written permission.

Stallions will be delivered by the Department at the nearest railway station to the place where they are to stand at stud, and expense of railage will be borne by the Department. At the termination of the season the stallion will be taken over by the Manager of the Government Stud Farm, or his representative.

Stallions will not be allowed to run with mares unless by special arrangement.

Due care must be taken that stallions shall not serve mares suffering from any contagious diseases.

The Manager of the Stud Farm or his representative to have the right to inspect the stallions leased at any time.

In the event of a stallion dying during the period for which he has been leased, from any cause through which the lessee is to blame, the lessee will be liable for a sum equal to the price already paid for the hire of same.

The lessee to be responsible for the good care and attention of the stallion and his equipment.

Should any of the foregoing rules not be complied with, the Department shall have the right to remove the stallion at once and to take any action desirable for the recovery of damages, the lessee to forfeit the money paid for hire.

Name of Stallion.	Pedigree.	Leasing Fee.
Sir Reginald (Brown)	Hagioscope / The Empress Maud.	£50
Toredo (Chestnut)	Torpedo / Thetis	£50
Our Jack (Brown)	Sheet Anchor / Dalliance.	£30
Cairn Ryan (Bay)	Enthusiast / Finnart	£45
D'Arcy (Bay)	Ayrshire / Cosy	£50
Florismart (Dark Bay)	Martagon / Floranthe	£50
The Orphan (Brown)	Dick Swiveller / Beehive	£35
Mon Roy (Chestnut)	Orme / Mon Droit	£50
Candil (Chestnut)	Sargento / Vahlia	£35
Voltaire (Brown)	Warpath / Maythorn	£35
Tarrone (Bay)	Redcourt / Lottie	£30
King Fish (Brown)	Fly Fisher / Little Nell	£30
Kennythorpe (Brown)	Calthorpe / Kenny	£40
Little Dick (Dark Bay)	Dick Swiveller / Magenta	£40
Proxy (Bay)	Earl Douglas / Dentelle	£40
Jamaway (Chestnut)	Jeddah / Sandiway	£50
Narhillah (Chestnut)	Bailol / Little Nell	£50
Radium (Hackney) (Black)	Vitality / Ruby	£40

All applications should be sent in by the 31st of July.

Applications must be addressed to the General Manager, from whom any further information can be obtained.

Telegraphic address :—
"Landbouw", Standerton.

Postal Address :—
Government Stud Farm, Standerton.

A. McNAE,
General Manager, Government Stud Farm, Standerton.

F. B. SMITH,

Acting Secretary for Agriculture.

June, 1911.

SALE OF GRAFTED VINES, TOKAI.

This year's public sale, by auction, will take place at Tokai, at 11 a.m., on Tuesday, 4th July next. The varieties and numbers, more or less, for disposal are :—

On Rupestris Metallica.—Red Muscadel, 11,000; White Muscadel, 4500; Pedro Ximines, 3000; White Currant, 5500; Black Currant, 12,000; Crystal, 500; Sauvignon Blanc, 3000; Flame Coloured Tokay, 400; Sultana (2 years old), 24,000; Black Hamburgh (2 years old), 1000.

On Jacquez.—White Hanepoot, 28,000; Red Hanepoot, 50,000; Red Muscadel, 11,000; White Muscadel, 5500; Muscat Hamburgh, 3500; Waltham Cross, 3000; Black Hamburgh, 3000; Almeria, 2000; Golden Queen, 700; Sultana (2 years old), 6000.

On Aramon Rupestris.—Pedro Ximenes, 2000; Barbarossa, 1500; Pontac, 6000; Crystal, 800; Raisin Blanc, 1500; Sauvignon Blanc, 4000; Mataro, 200; Shiraz, 200; Malbee, 200.

On Rupestris du Lot.—Sauvignon Blanc, 3000; Black Currant, 1000; White Muscadel, 1300; Red Muscadel, 1400.

On 1202 *Hybrid.*—Red Muscadel, 2500; Red Hanepoot, 12,000; White Hanepoot, 8000.

On Aramon Ganzin.—1000 Almeria.

Vines grafted on "Jacquez" and "1202" will be offered at an upset price of £6 per 1000, all others at £5 per 1000, except Flaming Tokay, Muscat Hamburgh, Almeria, Waltham Cross, Black Hamburgh, Golden Queen, which will be offered at an upset price of £1 per 100, and Sultana (2 years old), at £4 per 1000.

Bids will be accepted only from bona fide farmers or their representatives, to whom sales are restricted.

The vines will be put up in the order as advertised; the buyer of any lot of 1000 will, however, be entitled to take 3000 at the same figure, should he elect to do so and the number available for sale justify it; buyers may purchase as many separate lots as they may wish. In the event of any dispute as to a bid, the lot will be put up again.

All vines purchased must be paid for on or before delivery.

Delivery of vines purchased must be taken when ready for delivery by seller.

Vines required to be sent by rail will be specially packed and delivered at Retreat Station, at a small charge covering cost.

The seller accepts no responsibility for vines once delivered over to the Railway Department.

The seller undertakes to deliver grafted vines that have taken well at the graft.

Free conveyances will be provided to meet trains timed to arrive at Wynberg Station between 9 and 10.5 a.m.

Light refreshments will be provided.

Further information on application to the undersigned.

G. H. BRIGHT,
Acting Superintendent.

Porter Reformatory, Tokai,
P.O. Retreat, 5th May, 1911.

Agricultural Show Dates, 1911.

TRANSVAAL PROVINCE.

Barberton.—23rd June.

NATAL PROVINCE.

Dundee.—15th and 16th June.
Ladysmith.—20th and 21st June.
Victoria County.—21st June.
Alfred County.—21st June.
Weenen (Estcourt).—22nd and 23rd June.
Umzinto.—28th June.
Pietermaritzburg.—29th and 30th June and 1st July.
Camperdown.—3rd July.
Durban.—5th, 6th, and 7th July.
New Hanover.—20th July.
Richmond.—20th July.
Mid-Illovo.—10th August.

Date of issue.	Date of issue.	Date of issue.